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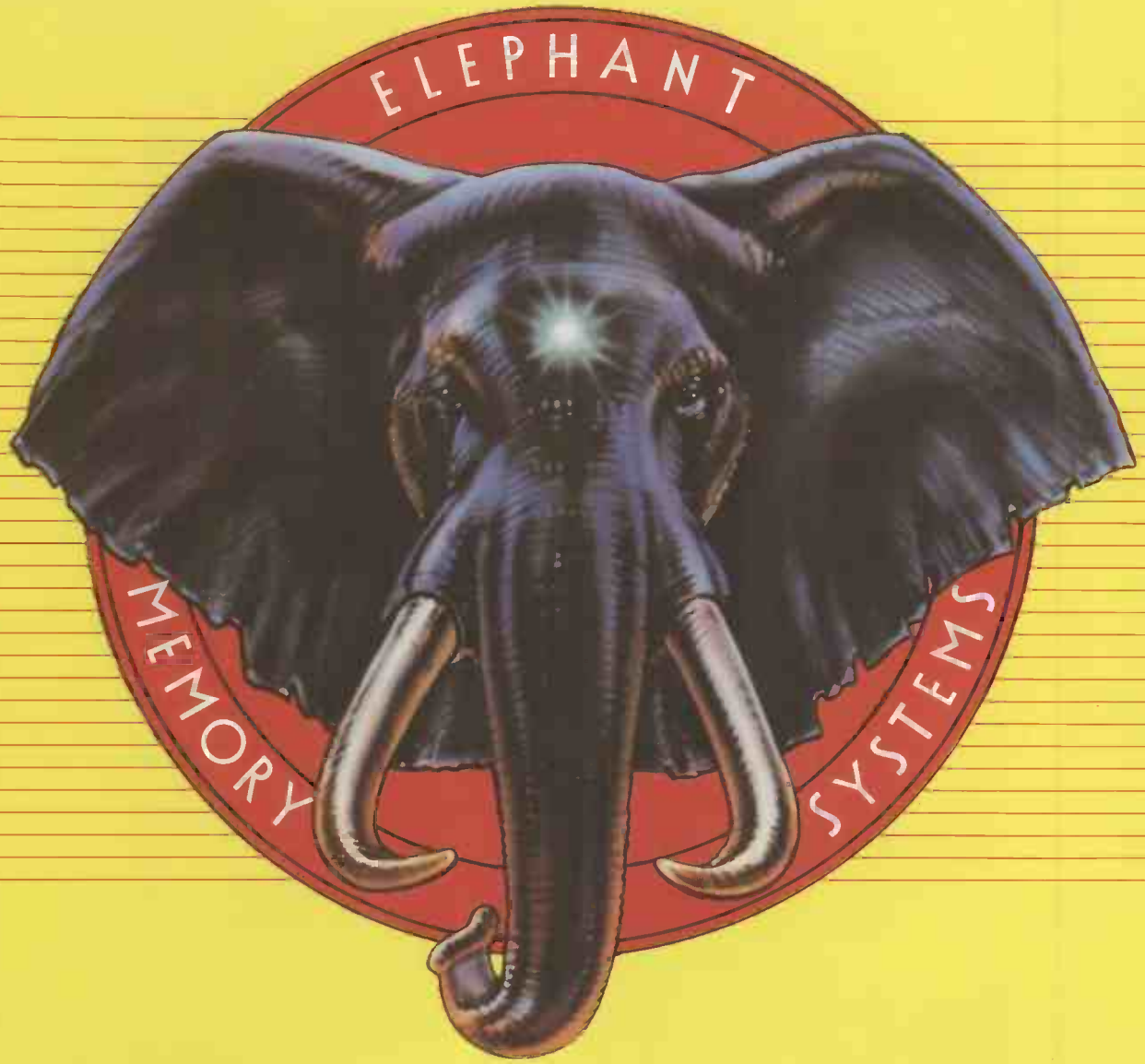

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PRACTICAL COMPUTING

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Will mainframes survive?

In the beginning was the micro. Then came the personal computer, whereupon IBM hijacked the name. Now PC means, primarily, the IBM PC. After that it means any other kind of personal computer — if you're lucky. However, even the PC is going out of fashion. The coming thing is the "work station".

Today the real computer user no longer has a micro. Instead he or she has a desk-top PC linked to the corporate mainframe — that is, a work station. This marketing ploy helps the big computer manufacturers to sell micros to the data-processing departments of big companies, some of which hate micros on principle.

It also skirts round the problem described in last month's editorial, which is that the PC or IBM PC standard is rapidly going out of date. Why should anyone buy a PC when there are new micros coming that offer the same power, or twice the power, for about half or a quarter of the cost? Well, it's OK because you are not buying a micro at all, but something much grander: a work station.

There is no argument that some IBM compatibles currently offer good value in personal business computing. This is not just a matter of the price/performance ratio. Such factors as the availability of software and hardware adds-ons, ergonomics, hot-line support, durability, maintenance and repair costs must also be taken into account. Then the purchase of a PC — even an IBM PC — may be the right choice for many users. The problem with the work station concept is that mainframe-compatibility is being used as a substitute for that kind of analysis.

As a result, users are ending up with computers that are quite inappropriate to their needs. And companies are spending three or four times as much as they should be, for installations that perform less effectively than much cheaper options.

Managers who could do all their work on an Apricot F1, RML Nimbus, Philips Yes or whatever, get lumbered with 3270 PCs or XTs with micro-to-mainframe links. Executives who could really motor with an Apple Macintosh end up with ICL DRS-20s, and so on. For a while this strategy will satisfy companies and their data-processing departments. The problem is that corporate mainframes will soon be unable to cope.

A recent article in our sister paper *Computer Weekly*, 5 September, projects current mainframe developments into the near future. This shows that "current mainframe computer technology cannot continue to meet predicted user requirements for any significant length of time".

Mainframe sites find they need to expand their mass storage facilities by 40 percent a year. The reduction in the relative size of storage units over the last five years has been 15 percent compound per year. So even under the status quo, unless there is a dramatic breakthrough in packing density, every floor of every office is going to be filled with mainframe disc drives within the forseeable future.

But the status quo is not going to be maintained. As we have seen, the trend in personal computing is to connect PC-based work stations to mainframes. Perhaps the idea is distributed processing, but the result is simply that individual users increase the strain on the processing and storage capabilities of already overburdened mainframes. This will lead to catastrophe and collapse, and then to ire, envy and despair.

Practical Computing does not believe that the mainframe industry, while it may decline, will actually wither away and die. Nor do we subscribe to the popular view expressed by Will Zachmann, vice-president of corporate research for analyst International Data Corporation, that "over the next few years even the largest [mainframe] manufacturer will be understood as peripheral to the PC desk-top work station, and not as now the other way around".

We think the mainframe suppliers will eventually survive by modernising the creaking dinosaurs they sell today. And we think the microcomputer market will continue to go from strength to strength. Whether the PC or PC work station will still be part of the micro market, or whether it will atrophy in the deathly grip of corporate data processing, remains a matter of curiosity, but little real importance. The real micro market can live without it.

5 YEARS AGO...

Nowadays, the arrival of a new 64K micro on the market is almost a daily event. However, when that product bears the name IBM, one must look at it in a different light to the run-of-the-mill offerings.

The first IBM machine to attack the micro market was the 5110, it had very little built-in software and made little impact on the scene. The new machine, the 5120, is a much re-designed version of the 5110, and will run most of the software from the earlier machine. It is designed to sell both to existing IBM mainframe users and to the first-time buyers.

Apart from the two printers the computer has 16K, 32K or 64K. The two integral discs are 1.2MByte each and a further 2.4MByte may be attached externally. The user can either select a version with APL and Basic in ROM, or if preferred, a system with Basic only.

As far as the price is concerned, for a 2Mbyte system with 64K and a 120cps printer, the approximate price would be £8,500. Application packages work out at about £1,000 a piece, and delivery is immediate.

PC Volume 3 Issue 11

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FEEDBACK

Our Feedback columns offer readers the opportunity of bringing their computing experience and problems to the attention of others, as well as to seek our advice or to make suggestions, which we are always happy to receive. Make sure you use Feedback — it is your chance to keep in touch. Write to

Feedback, Practical Computing,
Quadrant House, The Quadrant,
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Software licences...

I AM writing concerning John Hannavy's problem with running Datastar on an Apricot. What surprised me most was his dissatisfaction with the Sanyo 555. I have not had a problem with mine that was not self-induced. At the price it is unbeatable, and more usable than the f1. There is a great deal of public-domain software available, as well as a good user group, though of course there may be the same for the Apricot.

The question of signing software licences is interesting. You do not discover the need to sign the licence until you have paid your money, made the contract and taken the machine home. This alone in law should make the licence unenforceable. If you do not wish to sign the contract, I doubt if this would be taken as sufficient reason to claim a refund.

None of this of course detracts from the fact that it is obviously wrong to forge copies of software for any nefarious purpose. But if I buy a book, I am not restricted to reading it in one place, nor forbidden to let anyone else read it. Purchase of a program should give unlimited use of that program to the purchaser or anyone that he or she permits, the same as would apply to the purchase of a car or any other article.

Perhaps the true value of software is shown with machines like the Sanyo. It just is not possible for the software given with the machine to be worth £1,000 when the machine and software together can be had for some £800. If software were sold for its true value, perhaps piracy would not take place. It will be interesting to see if Adam Osborne's Paperback Software achieves this aim.

B TOWNLEY-FREEMAN,
Wallingford,
Oxfordshire.

. . . are they legally enforceable?

I WAS intrigued by your correspondence on the problem of transferring Datastar from a Sanyo to an Apricot. I operate a Wren Executive which came bundled with the Perfect suite, CP/M Plus, Z-80 BBC Basic, Executive Desktop and software to drive the 1,200/75 modem for use with Prestel. At no time during my discussions prior to the purchase with the company who sold me the machine was I ever told that I was merely being granted a licence to use this software.

On getting the machine back home I found a licence agreement inside for the use of the software I thought I had bought. I naturally simply tore up the agreement, which could in no sense be binding on me as it was never included in the terms of my contract with the vendors. When I purchased a copy of a well-known database program from another supplier well respected in my area, it was simply given to me. Imagine my surprise, therefore, when I read a notice contained inside saying that this too was only being rented to me on rather poor terms. I had of course no contract with the author of the program or the notice, and so on; it received the same treatment as before. It is simply not open to software authors or subsequent vendors to attempt to impose terms ex post facto in this manner.

I appreciate that authors of programs should and do receive the benefit of copyright, but to attempt to smuggle in conditions in this way is immoral but sadly not dishonest. Are you really suggesting that it is morally wrong that I should want now to be able to run my software on another machine? I am not speaking of selling or giving away copies, but simply utilising valuable software to its best advantage. Why should software houses cash in on the anarchy of standards in disc formats? Is it fair that I should have to buy two copies of the same program when I can only use one version at a time anyway?

N CRAPPER,
Dartmouth,
Devon.

THE EDITOR REPLIES: I have to say I agree with you. Also I do not know of any software house managing to impose these terms and conditions — that is, get the backing of a British court.

My view is that if you buy a piece of software you should be able to use it however you like, though always respecting the original author's copyright.

BENCHMARKS

WHEN reviewing products, the better hi-fi, car and camera magazines provide a large number of test results which enable the reader to form some kind of objective assessment of the product. You would think that computers, having both electronic and mechanical dimensions, would lend themselves even more readily to such measurement. However, none of the computer magazines — including yours — provides similar figures. Why not?

The idea that the performance of a £3,000 computer can be adequately estimated from the time taken to count the empty loop

```
400 FOR K=1 TO 1000
500 NEXT K
```

is dangerously simplistic. Indeed, you have pointed this out in several previous issues. However, you continue to publish the results of such antique Basic routines, and presumably people take notice of them.

The Basic Benchmark results will vary according to a number of factors, including the numerical accuracy involved — though this is never mentioned. The Disc Benchmark results will vary according to the placing of the files on the disc, the number of buffers used and so on, which means the decimal-point accuracy of the results is spurious. Many other features, from the amount of keyboard travel to the speed at which the hardware writes to the screen, remain unmeasured. Perhaps you would increase your sales, and your service to readers, by tackling these problems.

JAMES ALEXANDER,
Bradford 17.

THE EDITOR REPLIES: We are not particularly happy with the Benchmarks we publish, but they are the best we have, and they aim to provide comparability across a wide range of machines in their default configurations. Our reviews are not intended to completely specify particular machines, or provide full backing if you are buying a micro. But they do put new models in context in the market and provide a starting point for further investigation.

We have previously tried to secure the co-operation of such bodies as the NCC to produce some better benchmarks, and we are open to suggestions if readers have other ideas.

Microtext

ALTHOUGH Microtext can indeed be called a "well-established authoring system" — authoring language is a much more accurate term — which is "now available on the BBC Micro" — see *PC* September, pages 64-65 — it is actually the BBC implementation which has established the launguage. In this form it is used by a number of our clients and most of the software houses specialising in the authoring of training material.

Transdata has been selling CP/M-80 versions for a number of micros for about a year and ported this implementation across to CP/M-86. A PC-DOS/MS-DOS version is also available. The versions for Apple and Commodore machines have been waiting for some considerable time for companies willing to market the software.

Transportability in this context refers to the authored application software; the various versions of Microtext contain compatible interpreters for these program modules. Given that different machines/operating systems will support different screen displays, filing systems and OS commands, applications can only be transported directly to the extent that they are machine-independent.

Usability is a matter of taste.

(continued on next page)

(continued from previous page)

Experience shows that the in-built editor is sufficient for most applications and quick and easy to learn. As Microtext uses plain text files, authors can use their favourite word processor for the preparation of modules — perhaps using the Microtext editor later for screen formatting and colouring.

BBC Mode 7 is definitely the most economical screen format, but I would take the reviewer to task for dismissing Teletext graphics. Browse through Ceefax for inspiration, then try creating a screen of your own, both in BBC Basic and in Microtext.

Although BBC Microtext offers authors the same graphics commands as BBC Basic, the reviewer seems discontented with the graphics support. Microtext invites the use of separate graphics packages for creating pictures, which can subsequently be loaded into screen memory as picture files. However, animation is no trivial task for the average programmer in any language and Microtext is intended for use by trainers and educationalists, not by skilled programmers.

As far as the use of Microtext in computer assisted learning and computer based training goes, the reviewer criticises the danger of "lack of imagination". Microtext offers a natural structure for such material and includes the powerful tools that one would expect from an authoring rather than a programming language — that is, response matching and validation, help facilities, data logging and extensive screen-display control. These facilities are significantly more powerful than those found in many other comparable languages and allow greater creativity and flexibility with less effort to authors than either menu-driven authoring systems or conventional programming languages. Professional trainers should only approach the machine once the instructional design has been completed and certainly the part that requires imagination and creativity. This is even more true of interactive video.

As far as cost goes, in our view the power of the product, its efficiency in use, the potential for standardisation across a range of equipment and the support available from suppliers, users' groups and specialist authoring houses make the product very attractive. The IBM version, at around £250, compares favourably with many business packages for that machine.

The review identifies the advantage of the ROM for the BBC Micro, but failed to mention that £250 buys a complete authoring system for a very inexpensive and much-used computer. Comparable systems may cost from £3,000 to £30,000 while one authoring system for interactive video requires the services of a Vax.

Once material has been authored, it may run on any machine with an authoring ROM or on the Microtext interpreter with no authoring facilities and costing £50.

NEIL SANDFORD,
The Soft Option,
Kingston,
Surrey.

Word Counter

I SHOULD like to suggest a correction and a minor improvement to the Word Counter program published in the July issue of *PC*.

Lines 01C9 and 01CB seem to be in the wrong place and prevent the subsequent tests being carried out. Luckily the tests are rarely needed, so the difference in the functioning of the program is trivial.

I suggest that a test for square opening and closing brackets be included. The opening bracket is the important one, since some people leave a space after an opening bracket. The program as originally written would count brackets both preceded and followed by spaces as words.

GEOFFREY W GARDINER,
Knutsford,
Cheshire.

WORD COUNTER. LISTING 1

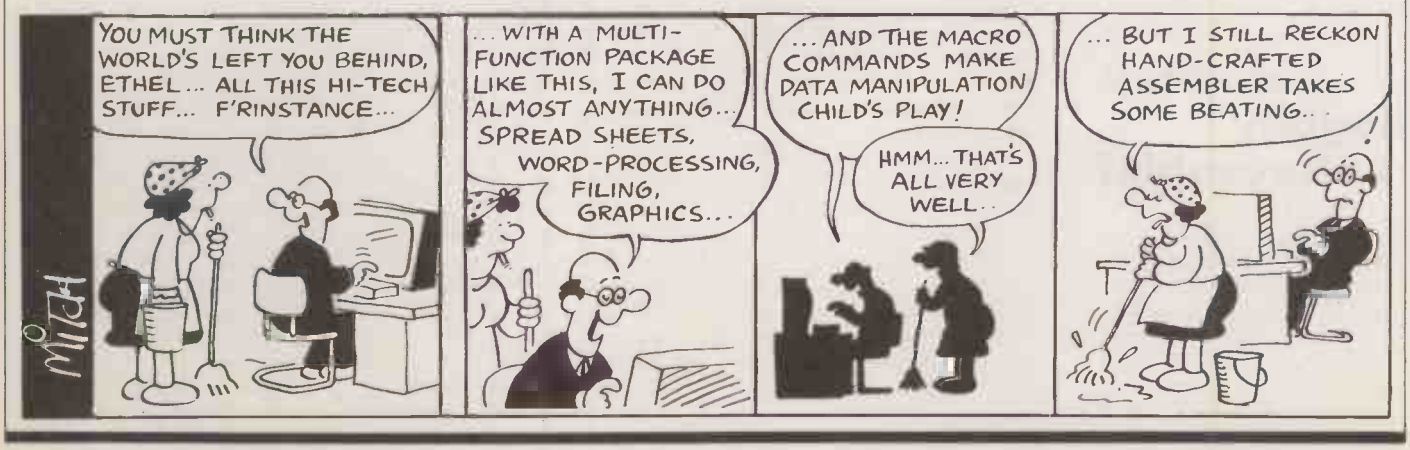
```
CPI     ' '             ;Check for a space
JZ      INTER           ;that separate words
CPI     LF              ;check for LineFeed
JZ      INTER
IF      FCOMMA
CPI     ','             ;possibly check for comma
JZ      INTER
ENDIF
IF      FDOT
CPI     '.'             ;possibly check for dot
JZ      INTER
ENDIF
IF      FQUERY
CPI     '?'             ;possibly check for query
JZ      INTER
ENDIF
IF      FEXCLM
CPI     '!'             ;possibly check for
JZ      INTER           ;exclamation mark
ENDIF
IF      FSEMIC
CPI     ';'             ;possibly check for semicolon
JZ      INTER
        ENDIF
        IF      FCOLON
        CPI     ':'             ;possibly check for colon
        JZ      INTER
        ENDIF
        IF      FTAB
        CPI     TAB             ;possibly check for TAB
        JZ      INTER
        ENDIF
        IF      FHYPHN
        CPI     '-'             ;possibly check for hyphen
        JZ      INTER
        ENDIF
        CPI     CR              ;check for Carriage Return
        JNZ     TEST
;
INTER:  MVI     B,1
```

WORD COUNTER. LISTING 2

```
CPI     '('             ;possibly test for left parenthesis
JZ      INTER
CPI     ')'             ;possibly test for right parenthesis
JZ      INTER
CPI     '['             ;possibly test for left bracket
JZ      INTER
CPI     ']'             ;possibly test for right bracket
JZ      INTER
CPI     '{'             ;possibly test for left brace
JZ      INTER
CPI     '}'             ;possibly test for right brace
JZ      INTER
```

JOHN AND TIMOTHY LEE **REPLY**: We agree with your comments about moving two lines in the program. The lines that have assembled at addresses 01C9 and 01CB should be just before the line that has

(continued on page 13)



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EasyLink telex costs —a breakdown.

(Telex)	
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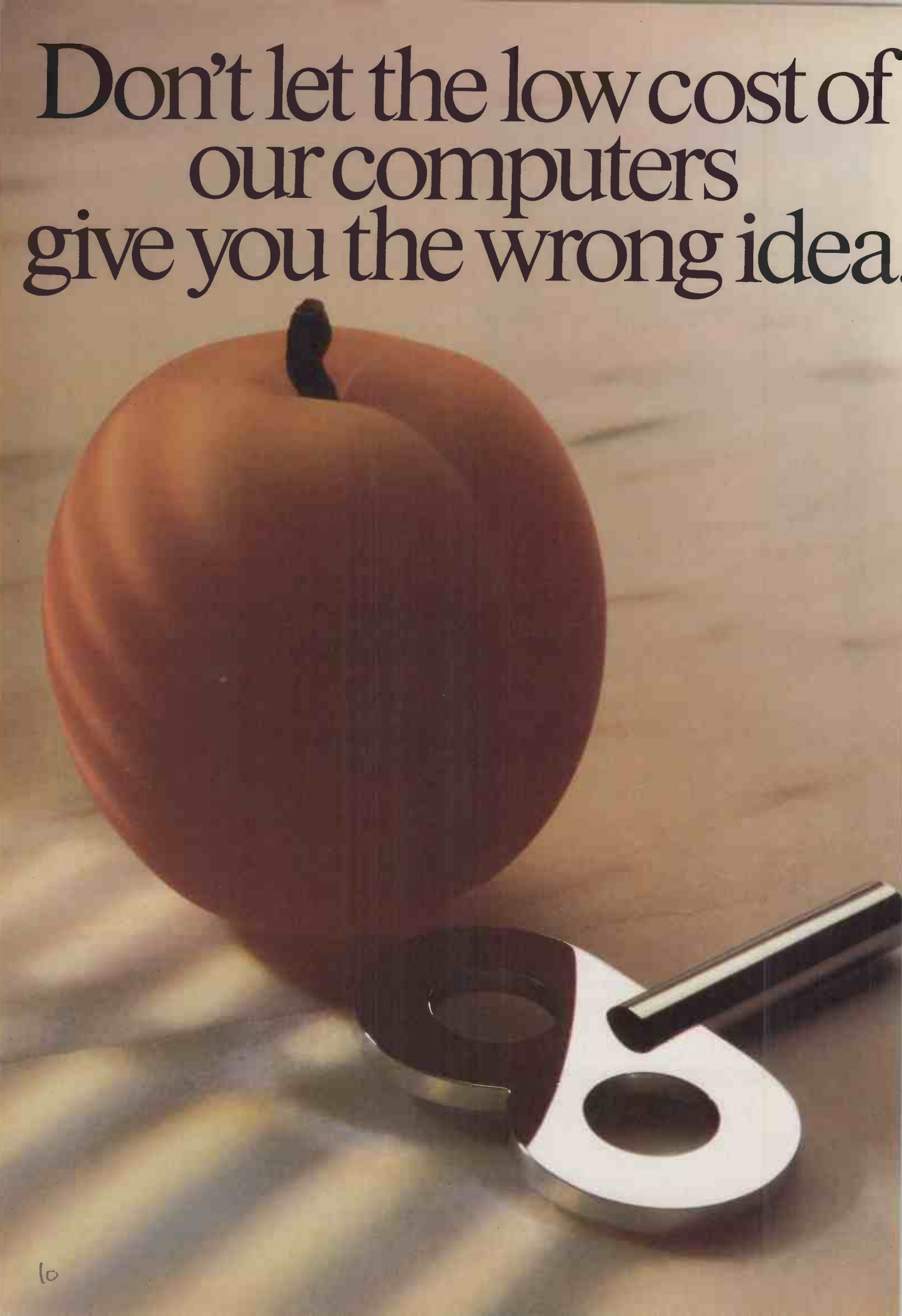

Rest assured there is nothing clockwork or Mickey Mouse about Apricot's 'Gateway' computers.

Take the Apricot F1 as an example.

To begin with it's a businesslike 16-bit micro.

Given its low price, most of our competitors' offerings only give you 8-bits to play with.

Play being the operative word. You can't run serious business software on their machines.

As an aside, that shortcoming also extends to schools and colleges. The 8-bit micro's can leave students ill-equipped for the outside world, whereas the Apricot F1e is top of its class in all respects.

Every Apricot uses the advanced 3.5" disk pioneered by us and now rapidly becoming the industry standard.

OUR SOFTWARE IS TOP OF THE BUSINESS POPS.

Our rivals can only offer childish, cassette-based systems which are slow and with limited capacity.

The Apricot system opens the door (or gate-way) to the very best in business software such as the best-selling Lotus 1-2-3.

In Europe alone, Apricot has 3,000 packages to choose from including the Apricot Accountant and Communiqué, our business information service.

Every computer in our 'Gateway' range has a free package of software.

This includes a screen-based tutorial, an electronic diary, a sketch program, GW-Basic (GW stands for Gee Whiz which gives you some idea of its talents) and with the Apricot F1 and F1e, the addition of Activity.

Activity's icon or picture-based commands enable you to get started easily and handle all the basic functions.

An optional extra is a remote control Mouse. This enables you to call up information without touching the keyboard.

The keyboard is also remote control so there are no wires cluttering your desk. What's more it has 92 keys (our competitors short-change you with as few as 58) including a numeric keypad for rapid calculations.

Your chosen Apricot can run the very best in colour on either your RGB monitor or ordinary TV set.

Unlike our competitors' offerings, Apricots can grow with your business. With the simple addition of expansion boards you can double your memory.

And as your needs increase, so you can add on more computers. Either from our 'Gateway' range, the juicier Apricot 'Collection' or the mighty micro's from our 'Professional' selection.

All work together in perfect harmony (we actually make the world's largest compatible range). Furthermore, all are fully networkable on a local basis. This means that up to 60 computers can work together.

It just goes to prove that our 20 years of successful trading is not based entirely upon competitive pricing.

If you'd like more information about our 'Gateway' micro's call us on Freefone Apricot (via the operator) or send the coupon.

We'll send you a brochure as well as a factual comparison between us and our competitors.

It certainly puts the toys in their place, the games room.

£895.*
APRICOT F1, 256K RAM, SINGLE 720K DISK.

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Please send me your free information package on the Apricot 'Gateway.' To: Apricot UK Limited, FREEPOST, Halesowen, West Midlands B63 1BR.

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Position_____

Company_____

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*PRICE DOES NOT INCLUDE MONITOR OR VAT AND IS CORRECT AT TIME OF GOING TO PRESS.

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Just Launched SuperStar 16 MK 2

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Each user has its own 16-bit CPU iAPX186 & up to 1Mbyte of RAM and a dedicated copy of Concurrent DOS 4.1

- Full MS-DOS 2.11 & CP/M-86 compatibility and record/file locking and printer spooling for genuine multi-user applications.

Up to 16 Users each with its own:

- 16-bit Processor iAPX186 @ 8 Mhz
- Up to 1Mbyte RAM
- Up to 3 Private Serial Ports; optional 8087 co-processor

Sharing 16-bit Master Processor with 1Mb RAM &:

- 3 Serial and 1 parallel ports
- Up to 512Mbyte Fast Winchesters
- 40Mbyte Tape Cartridge

- Each user running up to 4 tasks and 4 virtual screens; i.e. a total of 64 tasks simultaneously executed.

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- 4 virtual screens/multi-tasking
- Full Concurrent DOS 4.1, CP/M86 and MS-DOS 2.11 compatibility

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- Omicron Dealers to run 16-bit multi-user
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12

ADVERTISEMENT

IS YOUR COMPUTER AS CLEVER AS THE HYPER-MICRO?

Introducing the Hyper-micro — the first system to offer multi-processor based Concurrent DOS 4.1 with DR-Net. The power of more than sixteen 16-bit PCs in one with Concurrency for each user.

The limitations of the stand-alone PC are now widely known and no networking can disguise the shortcomings of such systems to meet multi-user computing requirements.

Today's successful business requires a fully integrated multi-user computer with easy expansibility as the needs grow.

The Hyper-micro offers multi-processor based Concurrent DOS 4.1, operating through DR-Net, to up to 16 simultaneous users from one central system. Multi-processing means allocating the equivalent power of one PC to each user so that no CPU degradation is experienced as more users added onto the system. This is a contrast to the "shared processor" principle most commonly used. Not only can all 16 users share the same data and communicate with each other but at the same time each user has, at his or her command, four virtual screens allowing up to four tasks to be conducted concurrently at each workstation.

Thus with such functionality and with more than the power of 16 PCs we think you will agree that the Hyper-micro adds a new dimension to multi-user computing.

How clever is your computer?

For more details see the opposite page.

● Circle No. 149

(continued from page 8)

assembled at 01F1.

Thus the lines

```
CPI CR
```

and

```
JNZ TEST
```

should be moved from their present position to appear just before the line

```
INTER: MVI B,1
```

as shown in listing 1.

If you wish to include tests for round or square brackets or braces then you should add lines of the form shown in listing 2 into the code with the other tests. This can be extended for any other character/s that you consider important. After these additions, the word "character/s" will now be counted as two words.

Smart trackball

WE WOULD like to point out a mistake in the information given concerning our trackball in the September issue of *Practical Computing*. It uses the keyboard socket connection on the IBM via a T connector supplied with the trackball cable. The keyboard then connects via the other end of the T. This means that no serial ports are taken up and also no power supply is required, but both the trackball and keyboard are active.

CLIVE ROWE,
Comtec Data Systems,
Harlington,
Middlesex.

Long live the workhorses

MAY I endorse the good word of Deborah Loth — see Feedback, September — in praise of your continued support of us old fogeys out in the sticks who are still using 6502s and Z-80s. My own word processing is done on a Pet 3032, and the Wordpro III program is much friendlier than many newer offerings running on MS-DOS, etc.

I do spreadsheet calculations on Supercalc on my three-year-old Osborne 1. Only rarely do I feel the need of something with more power or speed. Then I think back five years to doing it all with typewriters, calculators, Snopake and Sellotape, and the feeling soon passes.

Thank you for looking backwards as well as forwards. I for one will be waiting a while before scrapping my workhorses.

ALAN VINCENT,
Sherborne,
Dorset.

More CAD of PCBs

IN RESPONSE to "CAD of PCBs" in September's Ask PC, I would like to add the following British packages, all of which work on the IBM PC/XT/AT and compatibles, to the list of CAD PCB-design software products published: PCB Designer by Ward Partners, Vutrax by Computamation Ltd, and Redlog/Redboard by Racal. The cheapest of the three products includes auto-routeing and can be purchased for as little as £900.

If any of your readers would like further information or demonstrations we would be happy to oblige. Our CAD specialist is Bill Phillips and he can be contacted at the Northwood branch of Mass Micros on (09274) 20738/9

J V COWDERY,
Mass Micros,
Welwyn Garden City,
Hertfordshire.

Advance 86B buffers

I WAS interested to read the Last Word disc Benchmark article in the August issue of *Practical Computing*. I believe that I can throw some light on the problem experienced by Boris Allan when trying to use 70 buffers on the Advance 86B.

This problem is not limited to the Advance 86B, and has been noticed on a real IBM PC. It is not caused directly by buffer-space allocation, but by the much more general subject of memory space. If enough memory is allocated by MS-DOS so that Format is made to cross a 64K memory boundary, then the described behaviour will always be seen. This can be proved by generating a program of around 38K — 540 bytes for each buffer and its associated red tape — then loading this program permanently into memory by using a suitable system call.

The implementors of MS-DOS on each machine are the real culprits; it is they who write the machine-dependent parts of the Format program and its interface to the machine BIOS. In the case of the Advance, the problem is not with the actual Format call to the BIOS but in the Verify call that comes afterwards. The BIOS specification for its software disc interface says that no buffer address need be given for a Verify call. However, the address-checking code is still executed and by chance checks the address of the Format program itself for validity, including the crossing of the 64K boundary. Normally this works fine, but if lots of memory has been used up so that Format is loaded in a different place. . . .

If anyone is interested, I have produced a patch that fixes the problem in the Advance 86B.

BOB EAGER,
5, Bognor Drive,
Herne Bay,
Kent CT6 8QP.

Delta Card

HAVING read the review of the CMS expansion system by Roger Cullis in the August issue of *Practical Computing*, and noticed the set of Benchmark timings that you printed, I though that you might be interested to hear about the Watford Electronics Delta Card for the BBC Micro.

The Delta Card is a means of doubling the processing speed of a BBC Micro by the addition of an extra card. Fitted internally via a flexible ribbon cable, the Delta Card gives full compatibility with all standard software, whereas a 6502 second processor offering only a 50 percent increase of speed is incompatible with a large amount of existing software.

The Acorn 6502 second processor costs £175 plus VAT, with an average Benchmark time of 10.27 seconds. The Watford Electronics Delta Card costs £99 plus VAT, with an average Benchmark time of 7.80 seconds.

DAVID FELL,
Watford Electronics,
Watford.

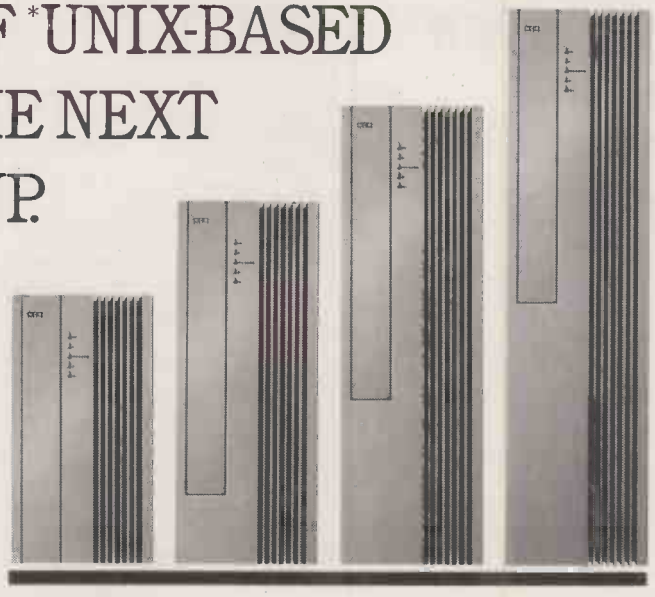
Sharp keywords

IN Feedback, September, Bill Jarvis asks about a number of unpublished keywords for the Sharp PC-1500.

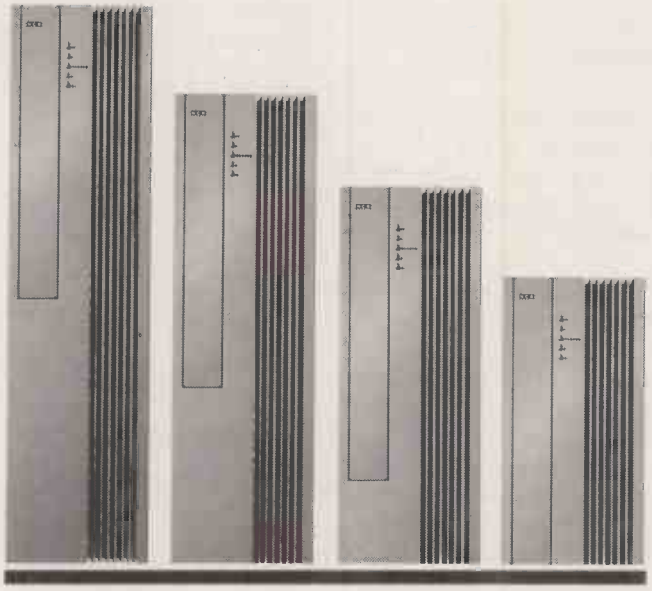
Much of what he wants to know can be found in the *PC-1500 Technical Reference Manual* which should be available from Sharp U.K. Some of what he's after is in *Getting started on the Sharp 1500 and Radio Shack PC-2*, by H C Pennington, Gary Camp and Ralph Burris. I strongly recommend the latter to those who have trouble with the rather odd Japanese/American of the 1500's instruction manual. It explains a lot of what the manual either treats too briefly or ignores altogether.

JOHN HOOPER,
Colchester,
Essex. PC

NCR's TOWER RANGE OF *UNIX-BASED COMPUTERS TAKES THE NEXT PERFORMANCE STEP UP.



AND A COST PER USER STEP DOWN.



NCR's expanding family of Tower computers utilise the latest technology to achieve successively higher price/performance levels – so enabling every user to afford more computing power.

The entry-level Mini Tower for example gives you the performance of a mini for the cost of a micro – providing access for up to 8 users.

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At each stage you will have the broadest possible choice of hardware, software and peripherals – thanks to the Tower's Unix operating system – the standard for multi-user systems.

All Tower computers are backed by a nationwide team of over 1000 field engineers and support staff. Plus a network of authorised distributors who can handle all your bespoke software needs. So you will get the maximum possible support in setting up, maintaining and expanding your Tower computing system.

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NCR Tower computers range from the Mini Tower catering for up to 8 users, through the 16-user Tower XP, to the 32-user Tower 32.

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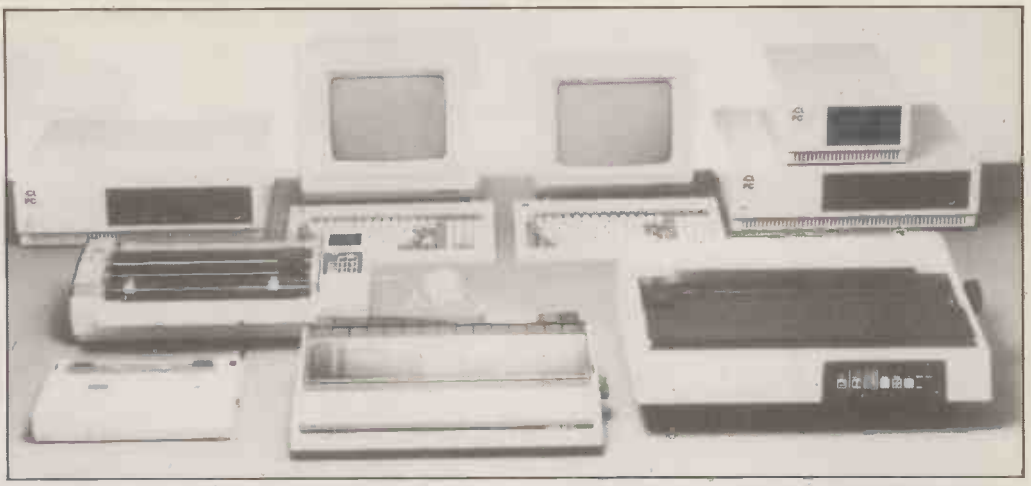
● Circle No. 150

HARDWARE SHORTS

- The Sinclair QL has been cut in price from £399 to £199.95.
- Victor has cut the price of its VI and VPC ranges. The entry-level price is now £1,399. More on (0494) 450661.
- The Digithurst Microscale IIR image-processing system allows data to be fed into packages such as Lotus 1-2-3 and dBase II. Details on (0223) 208926.
- The Wren Executive business micro has been relaunched by Opus at £995. Details on (0737) 65080.

- A private viewdata system for the Altos range of micros has been released by DTA Computer Systems, starting at about £11,500. More from Altos dealers.
- The Fortune 32:16 XP-45 has been reduced in price from over £14,000 to under £9,500. Details on (0344) 486555.
- Tonto, BT's version of One Per Desk, now has upgrades allowing it to communicate with mainframes. More from Freefone Merlin.
- The Juki 5510 dot-matrix printer can emulate an Epson FX-80 and IBM Graphics Printer. Cost is £349. More on (0256) 473232.
- The Torch TX-20 now comes with 1Mbyte main memory. The cost is £6,425. Details on (0223) 841000.
- The Matmos PC is a new incarnation of the Triumph Adler Alphatronic PC. Complete CP/M systems cost from £325. More on (0444) 414484.
- A family of digitisers has been introduced by Kontron. The Digicad range starts at £2,260, and has a 12in. square tablet. Details on (0371) 821188.
- Dhobi is an EPROM eraser from Cambridge Microelectronics. The cost is £18.95, or £22.95 with a built-in timer. More information on (0223) 314814.



ICL Quattro with CCP/M

AS ITS NAME suggests, the ICL PC Quattro supports up to four users. But running under Concurrent CP/M, the system can theoretically handle four simultaneous tasks per person as well. A total of 16 concurrent tasks is probably a little optimistic, though, since the chip is the humble 8086. The rest of the specification is also rather ho-hum: RAM expandable up to 1Mbyte, 780K floppies, with hard-disc options of 20Mbyte, 40Mbyte and 60Mbyte. The display offers resolution of 640 by 400 pixels in colour or black and white.

Prices start at £2,868 for one screen, Basic, two floppies and eight serial ports. For £5,100 you get 512K RAM, a 10Mbyte Winchester and one screen. Extra terminals cost £643 for mono, £899 for mono with graphics and mouse, and £1,399 for colour.

It is a tragedy that ICL seems unable to break out of the cycle of producing any given machine two years after everyone else. More details can be obtained on 01-788 7272.

Macintosh Hyperdrive

THE GRANDLY-NAMED Hyperdrive is an internal 10Mbyte hard disc for the 512K Macintosh which Apple is graciously allowing to be fitted without voiding warranties. Big speed advantages are claimed in loading and running programs. Unfortunately the price is also rather big: £1,995 plus VAT.

The distributor in the U.K. is P & P which carries out the modification; authorised Apple dealers are also empowered to do so. Turn-round time is about five days. More information on (0706) 217744.

Apple IIc CP/M Plus

CIRTECH has launched a Z-80 board for the Apple IIc which allows CP/M Plus to be run from disc. Bundled with the card is the full WordStar/Mailmerge software. The price is £280, and details can be obtained on (0896) 57790.

Microscribe 600

THE British-designed and built Microscribe 600 is a portable CP/M machine. It is designed specifically for unfriendly environments and has been made dust- and splash-proof. It comes with 128K RAM and a 64K ROM containing CP/M and Basic.

There is a 40-character by eight-line LCD, and QWERTY keyboard and serial ports. There is also an autodial modem with a Wake facility which allows automatic dial up and two-way flow of data at off-peak telephone charge times. The unit weighs about 3lb. and will cost around £800. Details on (06333) 73246.

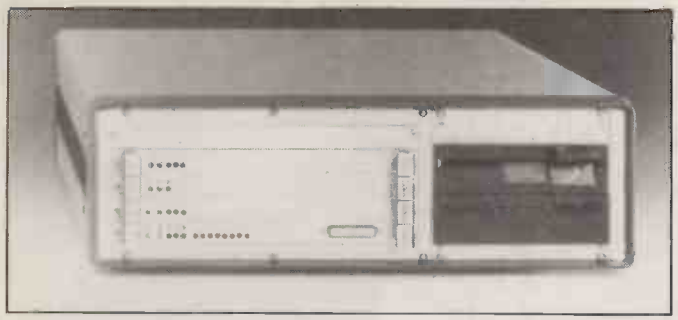
Bus-based Gemini Challenger

THE BRITISH micro manufacturer Gemini has launched the Challenger, a 68000-based machine costing around £5,000, including a Wyse terminal. The appearance of this machine also signals the introduction of a new bus, the 68K-bus, devised by Gemini.

The operating system is currently CP/M-68K; implementations of the p-System and BOS are under development. Under BOS, up to 16 users can be handled. The basic system comes with 512K RAM, a 1.2Mbyte floppy, a 20Mbyte Winchester, and one parallel and two serial ports.

Since it is bus-based, the Challenger is specifically designed to take expansion cards in its four bus slots. Gemini is on (0494) 791010.

(More news on next page)



Micro Force 1

THE MICRO FORCE 1 is a 68010 Unix V machine with 1Mbyte RAM, a 1Mbyte floppy and a 25Mbyte Winchester, all for £4,900. Fortran 77 is also included, though terminals are extra and cost £657 each. The system will support two users. Micro Force 1 is manufactured by the German company Force, and handled in the U.K. by Microsystem Services. Details on (0494) 41661.

HP Laserjet Plus

HEWLETT-PACKARD has announced an upgraded version of its Laserjet printer. The new model has 512K of RAM against 128K, which effectively increases sixfold the user-accessible memory. This allows a full-page resolution of 150 dots per inch, or a resolution of 300 dots per inch over one-third of the page. Other features include the possibility of downloading up to 32 founts; in the past cartridges were necessary.

The price of the Laserjet Plus is £3,518. The Laserjet itself has been reduced by £286 to £2,664. For *Practical Computing*'s Laserjet competition, see page 112.

Amstrad teletext

TELETEXT and telesoftware is available for the Amstrad 464, 664 and 6128 computers via an add-on from Volex. The TTX-2000A costs £145, and allows you to decode the signals broadcast by the BBC and ITV. More information is available on 061-736 5822.

Mac 10

IF you've ever wanted a Mac hard disc which looks like Doctor Who's K-9, Accent Computers have the Mac 10. It uses the Mac serial bus to achieve data-transfer rates of 0.6Mbit per second. An extra serial port is provided. The Mac 10 disc can be partitioned into volumes which may be as small as 400K. The price is £1,495. Further information on 01-373 7714.

Rair Minimicro

RAIR has extended its range of micros with the Supermicro 50 and the Minimicro, both based on the 80286. The Minimicro costs just under £7,000 and offers 512K RAM, a 25Mbyte Winchester and a 1Mbyte floppy. The Supermicro 25 has an 80287 co-processor. It costs £8,000. Details on 01-836 6921.

Opus Challenger

THE CHALLENGER provides a 5.25in. 40/80-track disc-drive unit for the BBC, with 400K or 720K storage capacity. The unit includes 256K RAM, which is used as a RAM disc. The cost is £249.95, including VAT; a separate RAM disc upgrade from 256K to 512K costs £49.95. More on (0737) 65080.

Serial and parallel booster

INSTALLING the Truedata Booster mid-way along your cable run allows signals to be transmitted over twice the normal distance before degradation sets in. The serial booster costs £98, and the parallel version for use with Centronics interfaces costs £89. More information from DN Computer Services on (0706) 67567.

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Ralph "I'm over the Moon Brian" Clegg.
A shrewd manager who has developed a system using players with outstanding individual flair. But with the ability to produce blistering performances as a team.
An idea that, surprisingly, has inspired a superb software package from Innovative.

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Most "all-in-one" packages don't score because all their application functions are limited by one format.
But Smart's "modular integration" concept allows each module (Smart Spreadsheet with Graphics, Smart Word Processor, Smart Data Manager, Smart Communications and Smart Time Manager) to achieve its full potential.

Smart System modules can be used separately as single applications or called upon in any combination. So you can kick off with financial figures and then chip-in written text, selected data or graphics. Which makes tackling the most complex reports easy.
Yet all modules can work together as a "team". And are capable of transferring data, passing commands, linking two or more functions and sharing information. Automatically.

EASY TO BOOT UP

Smart System is simplicity itself to use. And runs on the Apricot, IBM PC, XT, AT and compatibles.
Most commands are the same from one module to another. But for users with advanced skills Smart offers special quick keys that speed you to specific commands without going through the menu selections.
Smart System is available from Softsel. Along with over 2,600 other titles from over 250 publishers.
Athletico however, have kicked off the new season on a particularly sour note. In their first match Captain Mickey "Crusher" Rawlings was sent off for a foul on the opponents' keeper.
But Mickey still maintains he went for the ball.

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Prof. Heinz Wolff gives Epson's new Taxi its toughest test yet: his mum.

"A 16-bit micro that anyone can start work on in ten minutes?" said Professor Heinz Wolff. "I must show my mother."

We asked why.

"Because she knows nothing about computers."

Ask a silly question. And that is how Heinz Wolff's mum came to put our money where our mouth is.

We reckon the new Epson QX-16 with Taxi is arguably the simplest business computer in the world to use.

Better still, it runs most off-the-shelf IBM software. So that becomes easy to use as well.

All of which meant nothing to Mrs. Ilse Wolff as she sat nervously in front of the QX-16 for the first time.

"All you have to do is move the mouse around the desk top," we said. Did someone suppress a squeal?

"Press a button and that's all there is to it."

Which it is. Because Taxi uses pictures instead of jargon to guide you step by step through a program.

Forget training your staff for weeks to use it. Forget wading through house-brick-thick manuals or trying to remember crazy code words.

Open a file, read a memo, use the calculator, write a business letter or report, work on a spreadsheet, whatever. Once you've handled one Taxi program, you can use them all.

You can even buy a complete Taxi business computing package, including one of the world's most reliable printers for just £2,750 (ex VAT).

Your local Epson dealer is the best person to talk to about getting Taxi in your office.

If you don't know who yours is write to us at Epson (UK) Ltd., Dorland House, 388 High Road, Wembley, Middlesex HA8 6UH. Or dial 100 and ask for Freefone Epson.

"If people aren't impressed with the new QX-16 and Taxi," said Professor Heinz Wolff, "I'm tempted to say I'll eat my bow tie."

"But that's the one I bought for you, Heinz," said his mother.

'TAXI' FROM EPSON

HEINZ WOLFF IS PROFESSOR OF BIOENGINEERING AT BRUNEL UNIVERSITY, CHAIRMAN OF THE EUROPEAN SPACE AGENCY MICROGRAVITY ADVISORY COMMITTEE, BROADCASTER AND CONFIRMED COMPUTER ADDICT.

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26-3127 64K Extended Colour Computer £199.95 Save £40 £159.95

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Tandy Corporation (Branch UK), Tameway Tower, Bridge Street, Walsall, West Midlands WS1 1LA. Tel. No. 0922 648181

Basic compiler from Microsoft

MICROSOFT has launched a new compiler for GWBasic and Basica, probably the most widely used version of Basic on MS-DOS and IBM-compatible machines.

Quick-Basic costs £99, and according to Microsoft allows programs to be compiled without modification, with full support for sound and graphics. The advantage of compiled Basic is that it runs faster.

Quick-Basic requires MS-DOS 2.0 or higher, and at least 128K of RAM. More details from Microsoft Ltd, Excel House, 49 DeMontfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741.

3D CAD

A THREE-DIMENSIONAL upgrade of Autocad, the best-selling computer-aided design package, is expected in the next few weeks. Autocad 3D runs on the IBM PC and other MS-DOS machines such as the Apricot. The complete package costs £2,500 plus VAT, but existing Autocad users can get the upgrade for £500.

Contact KGB Micros Ltd, 106 St. Leonards Road, Windsor, Berkshire SL4 3DD. Telephone: (07535) 50111.

Integrated accounts

BUSINESS FINAX is an integrated book-keeping system which runs on the IBM PC or Apricot. The basic module covers nominal, sales and purchase ledgers and costs £800 plus VAT; modules can be added for other tasks. Contact Orchard Business Systems Ltd. Telephone: (0403) 48461.

Expert shell

EXPERT EDGE is an expert-system shell which you use to build your own knowledge-based applications. Its main claim to fame is that you can link it to packages such as Lotus 1-2-3 and dBase III to extract data from them.

At £650 plus VAT Expert Edge is quite cheap for programs of its type. It runs on the IBM PC and MS-DOS machines. More details from Helix Expert Systems Ltd on 01-583 9391.

CHEAP WORDSTAR SIB

MICROPRO has launched a word-processing program priced below its existing WordStar and WordStar 2000 offerings. Called Easy, the new program is aimed primarily at first-time business users and costs £165 plus VAT.

Easy has a completely different user interface to WordStar, with pull-down menus to replace unfriendly control codes. Documents produced with Easy will be readable by WordStar.

The program will initially be available on the IBM PC and compatibles, and versions for other popular MS-DOS machines are expected to follow.

Contact Micropro International Ltd, Haygarth House, 28-31 High Street, London SW19 5BY. Telephone: 01-879 1122.

More software supports lasers

CONTINUING FALLS in the price of laser printers are fostering a growing number of programs designed to get the best from them.

Starjet from Control-C Software is a printer-driver program designed to link WordStar and HP's Laserjet more effectively. You put additional dot commands in your documents to do things like draw shaded boxes or change fount. Starjet costs £200 plus VAT, and runs on the IBM PC and a wide range of other 16-bit machines.

Laser from Rapid Terminals does similar things, this time with WordStar and DEC's LN-03 Laser printer. It lets you put mathematical and scientific symbols in your reports. Laser costs £65 and runs on the IBM PC and DEC Rainbow 100.

Doodle, Trilex's drawing package, which again works in conjunction with WordStar, has been enhanced to support both the Rank Xerox 4045CP laser printer and the HP Laserjet. Doodle costs £795 plus VAT.

Meanwhile Canon has decided to offer its LBP-8 laser printer in a specially priced bundle with Dataview's Wordcraft software, with a Canon A-200 IBM-compatible computer also thrown in. It costs just under £5,000.

Contact Canon on 01-773 3173; Control-C Software Ltd on (0734) 780019; Rapid Terminals on (0494) 450111; Trilex on 01-546 9670.

Sidekick now on Mac

BORLAND INTERNATIONAL has brought out a Macintosh version of Sidekick, the best-selling desk-top utility program for the IBM PC. It includes a calendar and notepad, and a print spooler to release your Mac for other uses while printing a file. Sidekick also lets you maintain address lists and merge them with Macwrite. The U.K. price is £69.95 plus VAT.

Contact Softsel Computer Products Ltd, Softsel House, Syon Gateway, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866.

Knowledgeman 2

KNOWLEDGEMAN 2 is aimed at the database/application-generator market dominated by dBase II and III. It has a built-in report generator and spreadsheet.

The end-user version costs £487.90 plus VAT; a more powerful version aimed at software developers is also available. Knowledgeman 2 runs on the IBM PC and other MS-DOS machines, requiring at least 320K of RAM.

Contact Softsel on 01-568 8866, or First Software on (0256) 463344.

SOFTWARE SHORTS

- With Acornsoft's Termulator ROM you can turn a BBC B into a terminal emulator for £34.50 including VAT. It offers VT-100, VT-52, Tektronix 4010 and TTY emulations. There is also a BBC mode, which allows the host computer's output to be sent direct to the BBC's screen driver. Telephone: (0223) 210111.
- TDI has released a multi-user version of the p-System which runs as a sub-task under Unix V on Motorola 68000-based micros. The £1,495 price includes UCSD Pascal and Fortran 77 compilers. Telephone: (0272) 742796.
- PCW-8256 support arrived from Hi-Soft before Amstrad's new word processor hit the shops. First offerings are Pascal 80, a Z-80 assembler development system called Devpac 80, and The Knife, a disc track and sector editor. The programs also run on the CPC-6128. Telephone: (0582) 696421.
- BOS 5.1, the latest release of the Business Operating System, includes a version with networking through BOS/LAN, allowing up to 64 micros to be linked. Telephone: 01-831 8811.
- Answers is a program for analysing surveys and questionnaires on most CP/M, CP/M-86 and MS-DOS micros. It can produce reports and bar charts, and costs £495 plus VAT from Argent Computer Services. Telephone: 01-207 1929.
- Elite's Format-PC word processor now includes a 35,000-word spelling checker and mail-merge. It runs on the IBM PC, Apricot, Apple and RM Nimbus, and costs £199. Telephone: (09328) 67839.
- Actel says Squirt is a simple program which transfers binary files between CP/M 2.2 micros. It costs £60 including VAT and postage. Telephone: (0604) 858011.
- The Ultimate ROM is a 32K ROM which adds the Idea outline processor, T-base filing system, and T-Writer text fomatter to your lap-held. The NEC-8201a version costs £190 plus VAT, and the Tandy 100/200 version £195 plus VAT. Telephone: (0234) 767758.

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SOUPED-UP OLIVETTI M-24

THE PERFORMANCE of the 8086-based M-24 was already so close to that of the 80286-based PC/AT — 7.2 seconds average Benchmark speed, against 6.8 — that Olivetti could not resist pushing it past the IBM model.

The M-24 SP is essentially an M-24 with a 10MHz CPU, no wait states in the RAM-access cycle, a 5MHz DMA channel instead of 4MHz, 3-1 interleaving on disc sectors instead of 6-1, and a few other esoteric bits of fine tuning. Yes, it works. More serious advantages of the SP model are the higher specification: it has 640K of RAM as standard and a 20Mbyte hard disc, with 32Mbyte, 40Mbyte and 60Mbyte options.

Olivetti has also launched the EGC (Enhanced Graphics Controller) as a rival to IBM's EGA (Enhanced Graphics Adaptor). This provides 16 colours and a resolution of 640 by 400 pixels with all models in the range, and without requiring a special display screen. It also seems much faster in operation than the EGA. A special version of Gem is also available to take advantage of the extra resolution. The EGC board comes bundled with an enhanced GWBasic for £583.

Finally, Jim Richardson has started an Olivetti PC User group, and is running a users' BBS on Fidonet on an M-24. The phone number is (0752) 364059. Jim Richardson can also be contacted via Telecom Gold 83:ICO093, or using old-fashioned unhygienic voice mode on (0752) 369914.

Contact Olivetti at PO Box 89, 86-88 Upper Richmond Road, London SW15 2UR. Telephone: 01-785 6666.

The Olivetti M-24 SP — set to overtake the IBM PC/AT?

Epson's Taxi

THE ICON-ORIENTATED user-friendly front end Taxi — reviewed on the QX-16 in *Practical Computing*, July 1985, page 60 — has now been released for the IBM PC and compatibles.

It claims several advantages over the similar Gem Desktop from Digital Research. First, the icons are much larger and clearer, and you can easily design your own. Second, each icon can stand for a group of files, such as those used when running WordStar.

Third, the Taxi utilities are still available from inside the package as it is being run. This is not the case when running standard packages under Gem where, once you have booted the program, you are on your own. Fourth, Taxi uses an expansion card which carries its own RAM, so this does not take up any user RAM under DOS.

The Taxi desk top provides a note pad, calculator, clock/calendar, printer setup and a game, Othello, all accessed via pop-up menus. The complete Taxi kit includes the interface card, mouse and software for £199 plus VAT.

Contact Epson (U.K.), Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. Telephone: 01-902 8892.

Sam 3001 AT

AN AT-COMPATIBLE from the Korean giant Samsung is to be sold by Coquin Software. It has an 80286 processor, 640K of RAM, Hercules mono-graphics card, 1.2Mbyte floppy disc, 20Mbyte hard disc, keyboard, monitor, two serial ports and one parallel port for £4,599 plus VAT.

Contact Coquin Software, Freepost, Lancaster LA1 1BR. Telephone: (0524) 381423.

Sharp PC-7000

THE IDEA of IBM PC compatibility eventually dawns on everyone, and the latest company to see the light is Sharp. It has just announced the PC-7000, an 8086-based mains-powered transportable with built-in back-lit LCD screen. The LCD is available in blue and green.

The PC-7000 has an AT-compatible keyboard, with the function keys along the top, 320K of RAM, two 5.25in. floppy-disc drives plus RS-232C serial and Centronics ports. The memory can be expanded to 704K, and a colour adaptor can also be fitted inside. Further expansion requires an expansion box, which provides three slots and an optional 10Mbyte hard disc.

Remove the separate connecting cables and the PC-7000 folds up as a 16in. by 6in. by 8.5in. box weighing 18.8lb. A near letter quality thermal transfer printer can be clipped on to the side, bringing the total weight up to about 27lb.

The PC-7000 should be on sale in November and is expected to cost about £2,000 plus VAT. Contact Sharp, Thorp Road, Newton Heath, Manchester M10 9BE. Telephone: 061-205 2333.

80186-based Goupil

THE FRENCH micro manufacturer SMT Goupil has founded a U.K. subsidiary to sell the new 80186-based Goupil G4. This PC-compatible micro has a key layout which follows the AT, except that the function keys are along the top of the keyboard.

The Goupil G4 has only three expansion slots, but the colour/monochrome graphics circuitry and RS-232C and Centronics parallel ports are on the motherboard, which can be fitted with up to 512K of RAM.

The entry-level G4 has 128K of RAM, one floppy-disc drive, DOS and Basic for £1,785. A twin-floppy system with 256K of RAM, and with Microsoft Windows thrown in costs £2,350.

Contact SMT International, Cambridge House, 180 Upper Richmond Road, London SW15. Telephone: 01-785 2411.

(More news on next page)

IBM SHORTS

● Intel's Above Board board, which makes up to 8Mbyte of memory available to programs like Lotus 1-2-3, is being distributed by First Software. Telephone: (0256) 463344.

● Robocom's highly regarded graphics package, which we reviewed in its early Apple II form in November 1982, is now a full-blown CAD package on the IBM PC. Robocad-PC needs 512K of RAM, a Hercules high-resolution graphics card and a Microsoft mouse. It costs £1,250. Phone Robocom on 01-263 8585.

● System Builder, the applications generator, now runs with both Pick and Revelation on the IBM PC/XT. Phone Aston Technology on 021-359 4861.

● The Warp Speed Light Pen is being imported by KPG Hardware House. Telephone: 01-995 3573.

● Miss Jones is a configurable printer utility which can queue and print up to 250 files, and thus speed up printing dramatically. It costs £49.95 plus VAT from Calibre. Telephone: (088385) 2024.

● Time Keeper is a diary and desk-top calendar/appointment scheduler with search and print facilities. It costs £227.70 including VAT from Caxton Software. Telephone: 01-379 6502.

Framework II

FRAMEWORK II is a new, improved version of Ashton-Tate's successful multi-function integrated software package. The comms and mail-merge facilities are fully integrated, an 80,000-word anglicised spelling checker has been added, macros can be captured live, and the spreadsheet runs twice as quickly as before. Files can be exchanged with dBase II and III, Multimate, WordStar, Displaywrite DCA, Lotus 1-2-3 and Visi-Calc DIF.

The price is £550 plus VAT. End-users who bought the program after 1 September get Framework II free; others can upgrade for £85. Contact Ashton-Tate on (0628) 33123.

Sperry HT/IT

SPERRY has launched two new industry-compatible micros, the PC/IT and the PC/HT, along with a new graphics tablet, voice-input system, printers, network enhancements, and a link-up between MS-DOS and Sperry 1100 mainframes.

The PC/HT is a dual-speed PC compatible with an Intel 8088-2 CPU, 256K of RAM, and a range of disc and monitor options. It can be fitted with a 20Mbyte hard disc and 33Mbyte external hard disc.

The PC/IT is an 80286-based AT compatible with 512K of RAM, which can be expanded to 1Mbyte on the motherboard and 5Mbyte in all. It has eight expansion slots, of which six take 16-bit cards. Two RS-232C ports, a parallel port and MS-DOS 3.1 come as standard. The price of the basic system unit is £2,850 plus VAT.

PC/Online is a menu-driven package that allows MS-DOS micros to use the discs, transfer data to and extract data from Sperry mainframe and Mapper systems, in a variety of formats.

Usernet is also available to link up to 56 PCs in a local area network. The PC Voice Kontroller comprises a speaker/microphone and an expansion card. It enables users to define up to 10 sets of 64 voice commands for each application program.

Contact Sperry, Information Systems Group, Sperry Centre, Stonebridge Park, London NW10 8LS. Telephone: 01-965 0511.

Inset

INSET is an American program which allows graphics output to be inserted into text. In fact, it is claimed that output from any graphics package can be inserted into any well-known word processor. Most popular printers are also supported. The price, £195 plus VAT, is reasonable for what it does.

Tashkl is also selling the Easylan network for up to 16 PCs — a starter kit for two costs £180 plus VAT — and the E-Z-Doz-It concurrent processing utility for £195 plus VAT.

Contact Tashkl Computer Systems, 24 Logan Road, Wembley, Middlesex HA9 8PX. Telephone: 01-904 4467.

Ericsson PC/TF

TWO new versions of Ericsson's PC include an internal bus adaptor. This allows them to be connected to an Alfaskop System 41 or 91 communications processor and act as IBM 3178, 3278-2 or 3279-2A terminals.

Software provides the choice of IBM SNA or BSC operation. The PC/TF 2 can run one PC application and up to four host programs concurrently, and provides for file transfer and local printing.

Contact Ericsson Information Systems, City House, 7 Gresham Street, London EC2V 7BX. Telephone: 01-606 0425. PC

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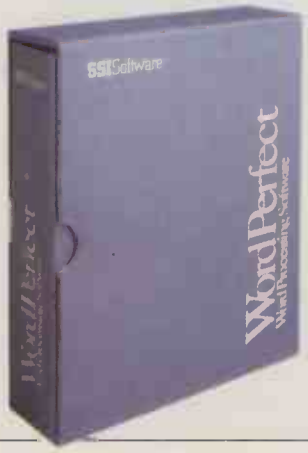

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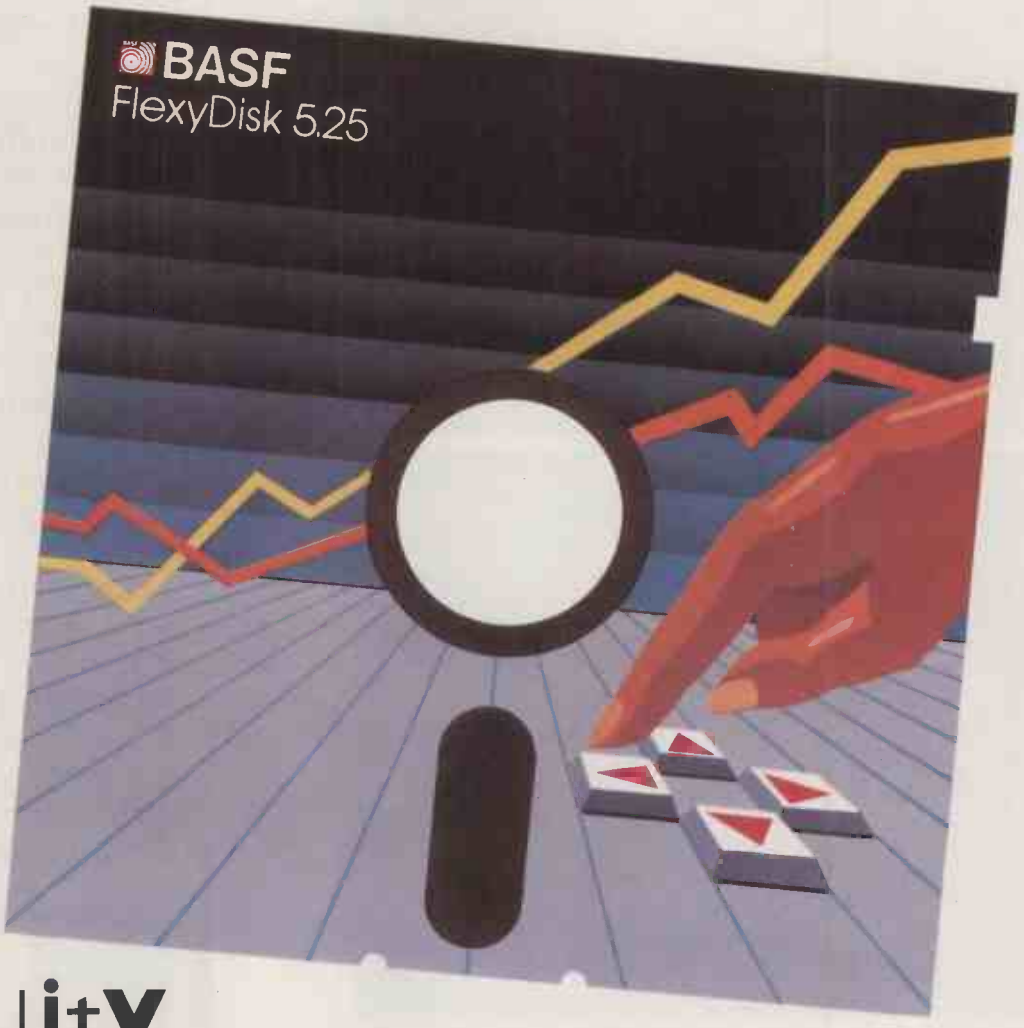

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SHORTS

● ABUG is the newly formed Acorn Business User Group, which costs £6.50 to join for six months. Contact Dave Silverman at Park Computer Services, 66 Amblecote Road, Grove Park, London SE12 9TW. Phone: 01-851 6461.

● Atari is offering a special educational discount on the 520ST to qualifying establishments. Phone: (0753) 33344.

● Paltex is a system for connecting DEC minis and micros into the telex network. Phone: 01-863 8622.

● The Usr Group U.K. has published a catalogue of Unix hardware, software and services. It is free to members and costs £45 plus VAT from 8 Chequer Street, St. Albans, Hertfordshire.

● The Transporta Softpac range of lightweight carrying cases is available to fit most popular micros and peripherals. Prices start at around £40. Phone: 01-878 8515.

● Unix training is now being given using an interactive video disc system developed by Telemedia in the U.S. Phone Computer Technology Group on (0272) 290651 or 01-734 1843.

BOOKS RECEIVED

The Econet Micro Guide by Christopher Dawkins. Published by Longman, £7.95. ISBN 0 582 36215 6. The author is a teacher who has been operating an Econet testbed for several years, and the book should be useful to anyone networking BBC Micros.

The Hitch-Hiker's Guide to Artificial Intelligence by Richard Forsyth and Chris Naylor. Published by Chapman and Hall/Methuen in BBC and Applesoft Basic versions. ISBN 0 412 26970 8. Two entertaining writers attack the main problems in expert systems, natural language, computer vision, machine learning, etc.

COMPUTER OF THE YEAR

EVERY year *Practical Computing* combines with six foreign computer magazines and votes for the Computer of the Year Awards. This year our votes are going to be cast as listed below. Of course, market conditions may vary on the mainland, so these micros and software packages may not be the final winners.

In the hardware category our Home Computer of the Year is the Amstrad CPC-6128; runner-up the Atari 130XE. Our vote for Personal Computer goes to Compaq Deskpro 286; runner-up the Atari 520ST. For Portable Computer we vote for the Tandy 200; runner-up the Data General One. The Compaq 286 wins our vote for the Transportable and runner-up is the Olivetti M-21.

In the software section our Game of the Year is Rescue on Fractalus and runner-up is Impossible Mission. We voted for Ashton-Tate's Framework in the Commercial Software category with Microsoft Word 2 as runner-up. Finally, we nominated Digital Research's Gem as best Software Tool and Borland's Turbo Pascal as runner-up.

VDU health hazards

THE Advertising Standards Authority reports that a safety officer complained about a promotional leaflet for the Somashield. The advertisers "failed, however, to provide any evidence which established either that 'harmful X-ray and ultraviolet radiation' was emitted from VDUs, and their rays would be harmful to the operator or that the product could reduce any health risks which might be incurred." The complaint was therefore upheld.

The ruling is consistent with recent Treasury and Civil Service guidelines, reported in *Practical Computing*, September 1985, page 13.

Humane Technology is holding a conference on the topic of "Alleged Health Hazards of Work at VDUs" at the London West Hotel on 26-27 November. The fee is £396.75. Phone (0509) 237428.

On-line directory

THE Directory of Online Databases has finally gone on-line. It can be accessed in Europe on the systems of Datastar in Zurich and Telesystemes-Questel in Paris.

The Directory of Online Databases contains descriptions of 2,764 databases offered through 414 on-line services. Of the 1,316 database producers, 843 are in the U.S. and 292 in Europe.

Contact Cuadra Associates, 2001 Wilshire Blvd, Suite 305, Santa Monica Ca 90403, U.S.A. Telephone: (U.S. area code 213) 829-9972.

Personal computer report

THE *UK Personal Computer Market 1985* is published by Wharton Information Systems, 12 Eton Street, Richmond-upon-Thames, Surrey at £650. This 252-page report is based on data from 600 major companies, interviews with the leading vendors and a review of product trends. Coverage of hardware companies ranges from Apricot to Wang, and of software companies from Apple and Ashton-Tate to Sorcim/IUS. The report provides an excellent overview of the market. To this it adds user responses, survey data and prognostications.

The report concludes, "In our user survey we found people who had not bought personal computers because they are waiting for costs to decline or for technology to stabilise. It is doubtful if costs will ever decrease to that extent and it is almost certain that technology will not stabilise". Instability — you can call it progress — is endemic, but Amstrad may have dented the first idea with the PCW-8256, and could do it again with a "dedicated spreadsheeter". The idea that "the next generation operating system in the second half of the 1980s will be Unix" is also open to question. However, this is still a useful and well-considered report.

Jail terms for copyright violators?

THE HIGH COURT in Taiwan has given six local businessmen six-month sentences for making Apple-compatible micros which infringe Apple's copyright. This sounds fierce but *Asian Sources Computer Products*, a magazine based in Hong Kong, informs us that each sentence is convertible "into a fine equivalent to about U.S. $40" or about £30.

Comms for viewdata

EPSON'S PCT-2 is now available with a Prestel terminal emulator which makes it possible for this battery-powered portable to access viewdata databases. Contact Epson at Dorland House, 388 High Road, Wembley, Middlesex. Telephone: 01-902 8892.

Xyllx can supply convenient viewdata packages for most popular micros, including Apple II, Apricot, Atari, BBC Micro, Commodore 64, IBM, Sirius and Tandy model III. Each package includes the software, modem and cables. Prices range from £99 for the BBC Micro to £179.95 for the IBM PC.

Contact Xyllyx U.K. Ltd, Whitechapel Technology Centre, 75 Whitechapel Road, London E1. Telephone: 01-377 1982.

Data protection

THE HOME SECRETARY has set a fee of £22 for data users registering under the Data Protection Act. The fee covers three years. Registration forms are available from main post offices.

The NCC has produced a Data Protection Act resource pack which includes a guide to the Act, training materials in the form of presenter's notes and overhead slides, VDU stickers, staff notices and an action plan. It costs £55 including post and packing.

Contact the NCC, Oxford Road, Manchester M1 7ED or any NCC Regional Office. Telephone: 061-228 6333. PC

The action at this year's Personal Computer World Show was not among the toy micros, nor the business clones, but in the area between.

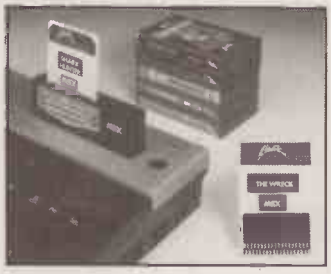
ATARI

ATARI dominated the show with the 520ST, thanks to a huge stand divided into dozens of tiny booths, each occupied by a software house demonstrating a program for the machine. Participants included Digital Research with the Gem Desktop, Draw, Logo, Basic and Toolkit suite; and BOS with its business operating system and Sales Ledger and Finder, etc.

Wasp had Time Recording. Metacomco showed its screen editor, Assembler and Pascal. Talent had Flexfile on offer, along with two adventure games: West and The Lost Kingdom of Zkull. Intelligent Software is adapting Cyrus Chess in 3D. Infocom showed Wishbringer and the Hitch-Hiker's Guide to the Galaxy. Softechnics had Time Link and Rhythm. Execon showed an integrated accounts program while Quest offered Cash Trader. Wasp had vertical-market packages for insurance brokers, accountants, solicitors and printers. Towngate offered Cash Manger. DevpakST was on show in the Hi-Soft booth, BTM-Soft showed Bbas Basic, which is based on BBC Basic. Other exhibitors of note were: Kuma with KSpread and others; GST with a C compiler and a macro assembler; TDI with UCSD-p and Modula-2; Prospero with Fortran-77; Software Punch with Atarinet; Silicon Chip with Staccounts; Minor Miracles with the start of a comms program; Microdeal with Lands of Havoc; Paradox with a desk diary/database and Mission Mouse; and English Software with ST Hyperdrive and others.

Also on the stand were a 260ST with built-in 3.5in. disc drive, and a working prototype of the 10Mbyte hard disc.

Above: the Atari 260ST with built-in 3.5in. disc drive.
Below: Electric Dreams' softcard.



ROM cards

MITSUBISHI PLASTICS and Electric Software both showed credit-card sized plug-in ROM cards, intended as a way of distributing software. Each card contains a bare ROM chip wired to an edge connector.

Both cards plug into a special cartridge, which is then plugged into the ROM cartridge slot of another computer. Both used MSX hardware, but naturally the two systems are mutually incompatible. The card should have the advantage of being cheaper to produce than a typical ROM cartridge as used today.

The Electric Dreams softcard is now being used to hold patients' medical records in the Medlock system, where the reader is a Sinclair QL. This project has been funded by the Pharmaceutical Society and is being studied, it is claimed, by the DHSS. The system is undergoing trials with 50 patients at a pharmacy in Wales. It is planned to expand this to 500 patients and to include doctors.

Amiga

THE TRUE STAR of the PCW Show was not even officially there. But Commodore's Amiga kept popping up both inside and outside the main hall. Metacomco of Bristol was understandably proud of its achievement in providing both the operating system and the Basic for the new wonder machine.

Unfortunately Commodore was just as keen not to tell people about it, largely because the U.K.

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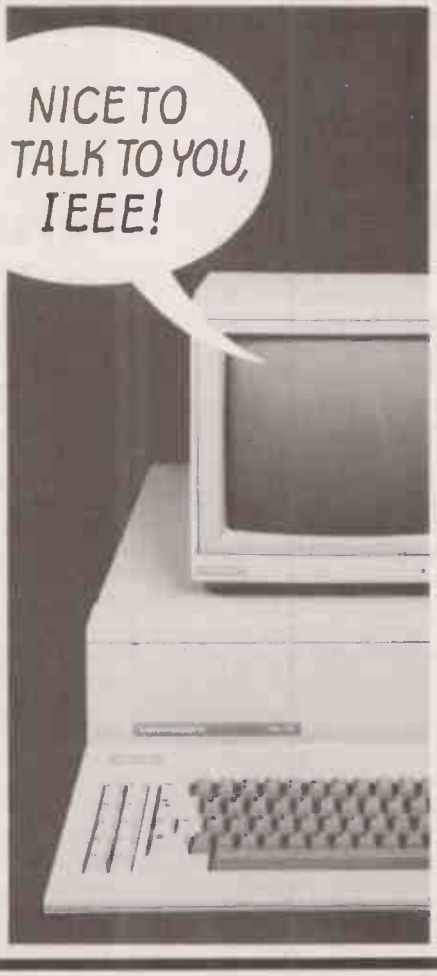


version will not be available until next year. To avoid ruffling too many feathers. Metacomco was giving private showings only to a lucky few.

Another select bunch were being shown the machine, and the same demos, officially by Commodore outside the show in a hotel down the road. This was aimed mainly at dealers and third-party suppliers.

One of the star turns was the bouncing ball routine. This showed a multi-faceted coloured ball bouncing against three walls, and turning as it did so. At each bounce there was a realistic bonk. Apparently the bonk started life as the sound of someone hitting a garage door, which was then fed into the Amiga, using the machine's sound sampling facility.

It was also possible to slide down this bouncing ball demo, and display another process running concurrently in a second window, with no slowing of the ball. An indication of the pricing level for some of the add-ons was given. The PC-DOS emulator will cost about $100, and a speed-up module to enhance DOS performance about the same. An IBM 5.25in. floppy disc will cost about $400, and a 20Mbyte Winchester $1,000.

Datavue 25

THE DATAVUE 25 from Interquadram is a battery-powered transportable which the manufacturer claims is 100 percent IBM compatible. It uses an 80C88 CMOS processor, and comes with 640K RAM as standard. There is one 5.25in. 360K floppy built-in as standard. The LCD has 80 characters and 25 lines, and there is a keyboard with an infrared link.

Other features include a parallel port and a serial port. The on-board modem has yet to receive BT approval. The unit weighs 14lb. including the battery, which will last from two to five hours, depending on the amount of disc accessing.

The Datavue 25 costs £1,998 plus VAT and is available from Interquadram on (0753) 34421.

Sanyo 885

THE SANYO 885 is an IBM compatible with 256K RAM standard, two 360K floppies, colour circuitry and eight compatible expansion slots. Along with MS-DOS is bundled the new WordStar 2000 program, which normally retails for over £400. The price of the machine is £1,390, which excludes monitors. A colour monitor costs £399 and a green monochrome one £119. Sanyo is on (0923) 46363.

Seiko

APART from the Amiga, one of the other exciting products on show was not exactly a computer, but could well have an impact on the field. Along with its wristwatch terminal described in June's *Practical Computing*, Seiko was demonstrating its new flat-screen TVs.

Unlike Sinclair's efforts, these used an LCD technology, and to good effect. Most impressive was the colour LCD. Unfortunately no one on the stand seemed to know how it worked, but the application to portable colour micros is clear.

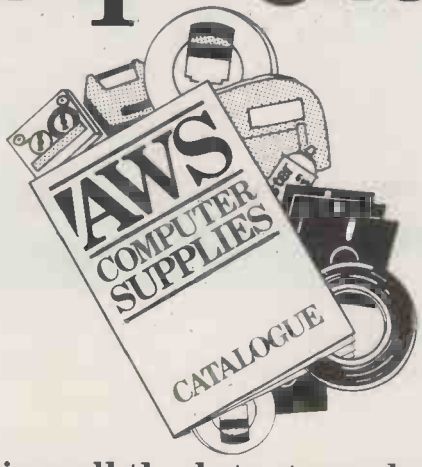
The demo models are not available in the U.K.; as yet only NTSC versions have been produced, but a Pal version may appear next year. The cost in the U.S. is about $180 for the monochrome and $300 for colour.

WS-3000 Miracle Modem

MIRACLE TECHNOLOGY has launched the WS-3000, a fully approved modem which can direct-dial to America using the U.S. Bell standards. Hitherto BT has refused to approve modems which use Bell frequencies because they upset some of the more delicate parts of BT's network. Miracle Technology has got round this by adding a further tone to cancel out the offending noise.

The basic model runs from 75 baud through to 1,200 baud half duplex, and costs £295. Top of the range gives full duplex up to 2,400 baud. More information on (0473) 216141. PC

Its a Squeeze



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*Thankfully it's at a very low amperage so you don't feel it, except when you spark off an earth. But your computer does! O.K., it won't go bang and stop, but static causes a slow gnawing away you will only notice when — the data and memory become fuzzy, printouts aren't as accurate as they used to be, disc drives start to malfunction. These all cost you money, as they have to be rectified by re-keying, or calling an engineer.

Laminate construction showing carbon dissipative layer.

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Static-Master pads are durable, and made from Formica† electrically conductive laminate,

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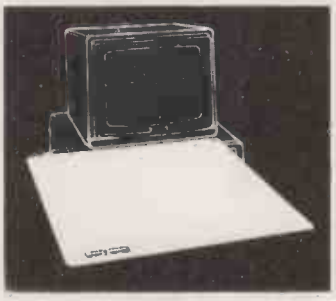

3mm thick. The edges are rounded smooth and the pad rests on rubber feet. An easily connected earthing wire ensures that the Static-Master pad can be fitted in all home/office environments. It is supplied in two colours, grey or almond, and 26" x 26" or 18" x 20" to match your computers' colour and footprint. At only £49.95 and £34.95 (plus Post and Packing) it is a small price to pay to ensure against degrading your computer, which could cost you hundreds or even thousands of pounds.

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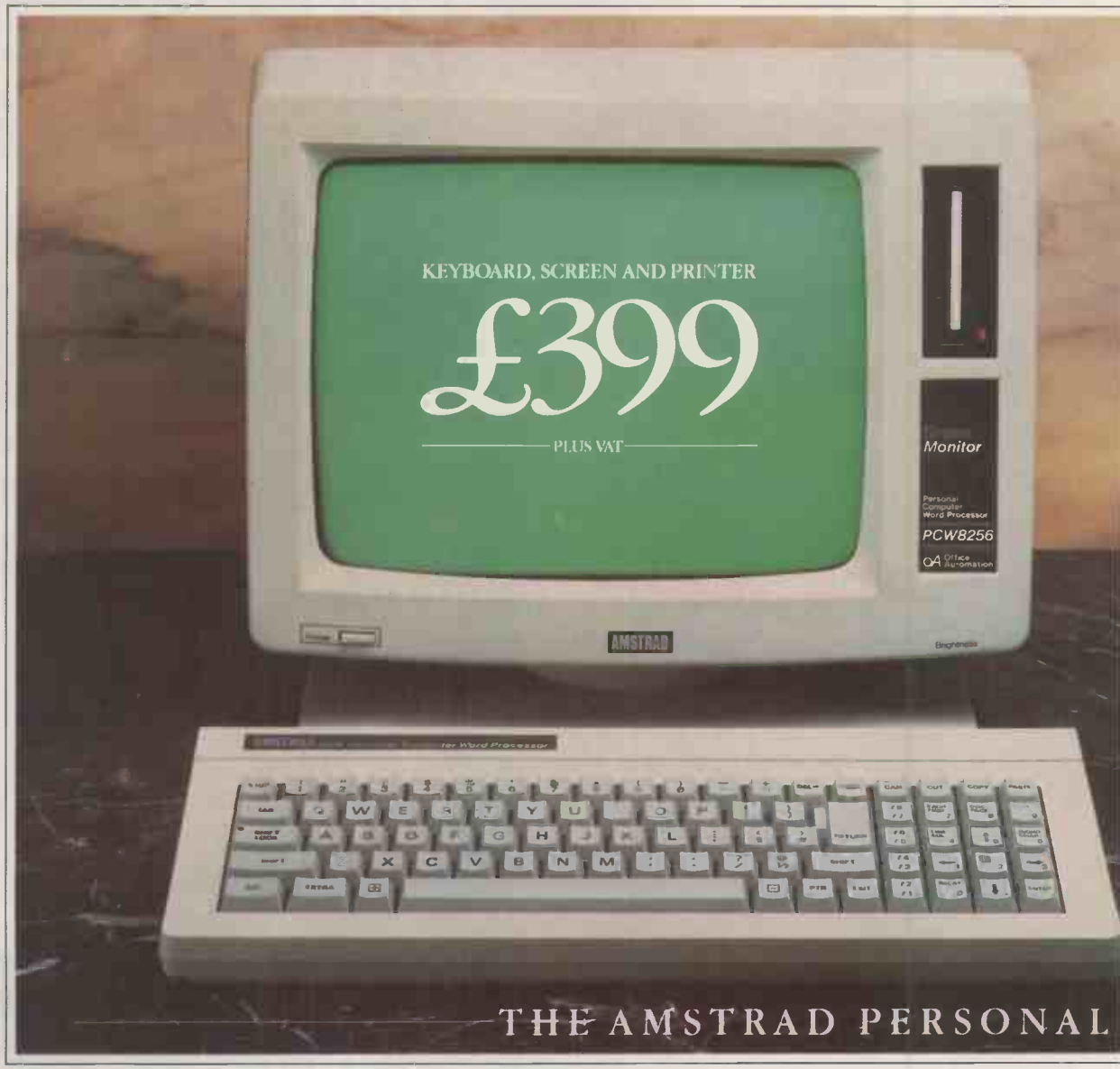

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refer to "pull down" menus as you work, so you don't have to memorise complicated codes. This simpl means it's easy to use.

And the PCW 8256 has an integrated printer, with compatible software that gives you a choice of letter quality and high speed drafting capabilities.

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PC/8256/1

Amstrad PCW 8256

Amstrad, P.O. Box 462, Brentwood, Essex CM14 4EE. Tel: (0277) 228888.

*CP/M is a trademark of Digital Research Inc.

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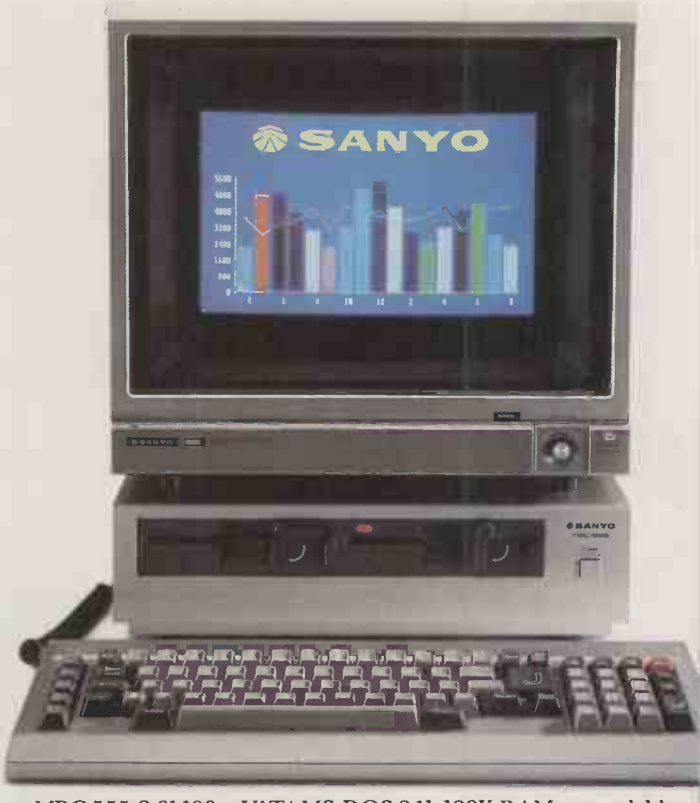
MBC 885 £1,390 + VAT.* MS-DOS 2.11. 256K RAM expandable to 640K. 2 x 360K drives. RGB colour/mono outputs. Centronics printer port. Seven IBM-compatible expansion slots. Provision for hard disk. Twice as fast as IBM PC. Free Wordstar 2000 software. Full IBM compatibility.



MBC 555-2 £1,190 + VAT.* MS-DOS 2.11. 128K RAM expandable to 256K. 2 x 360K drives. RGB colour/mono outputs. Centronics compatible printer port. Audio training tape. Free Wordstar, Calcstar Mailmerge, Spellstar, Reportstar, Datastar, Formsort. Extended basic software.

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Take a look at the Sanyo computers featured here and you'll begin to see what we mean.

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Unlike IBM machines, they're all equipped with colour capability and RGB output as standard.

And they bring you the opportunity to join the Sanyo Micro Users Association, with use of its special hotline for product and software support.

The machines on view here are just three in a twelve-strong range that's the most comprehensive available.

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MBC 775 £1,990 + VAT. MS-DOS 2.11. 256K RAM expandable to 640K. 2 x 360K drives. Built-in colour screen with RGB colour/mono auxiliary outputs. Centronics printer port. Two expansion slots. Twice as fast as IBM PC. Free Wordstar, Calcstar and GW-basic. Full IBM compatibility.

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Please send me full details of your range today.

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PC11/85

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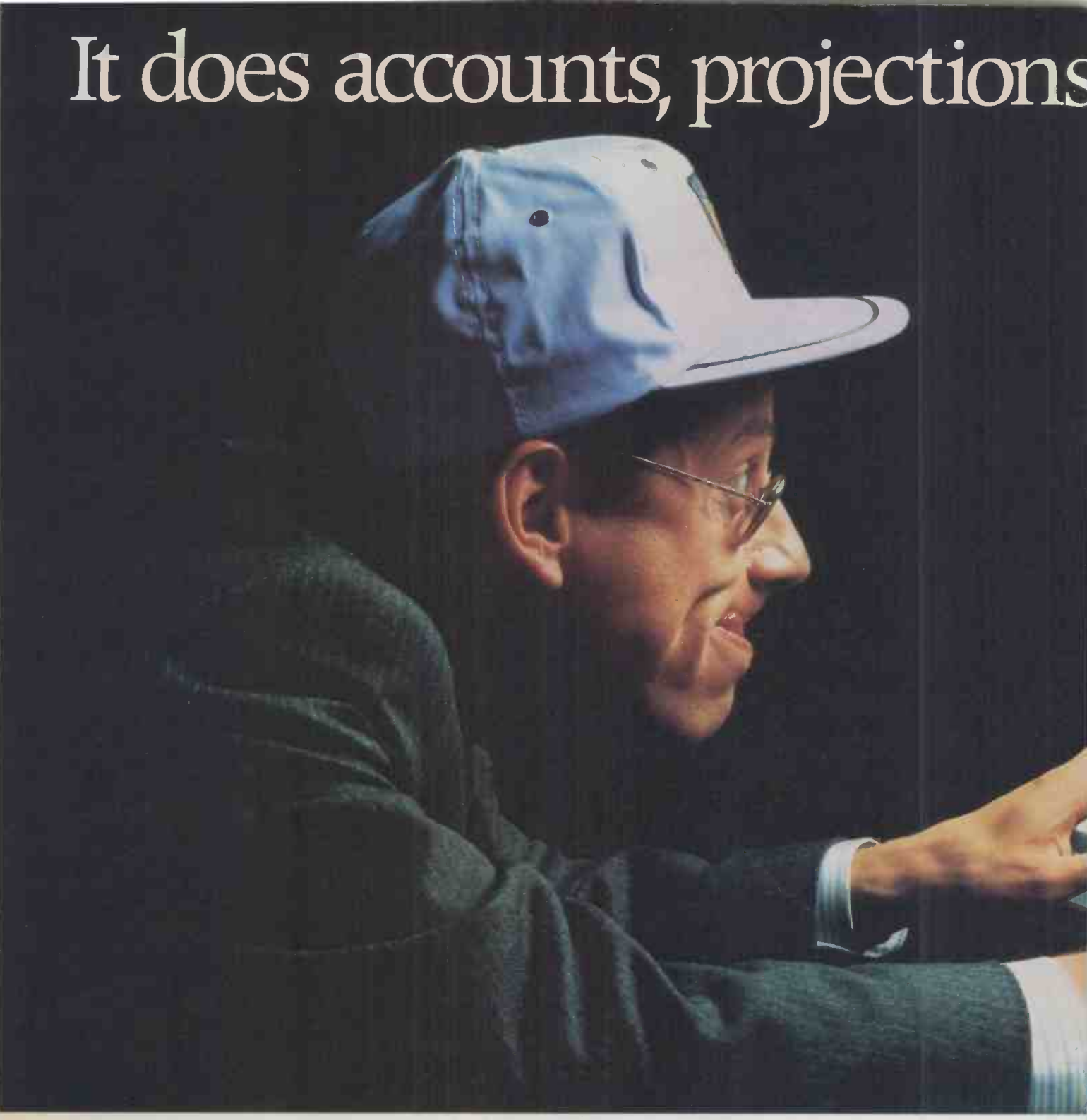


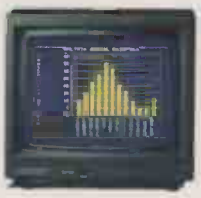
No wonder people are racing out to buy Amstrad's new CPC 6128 computer.

Not only does it answer all your business needs, it's also compatible with nearly 200 arcade and adventure games. So it can either speed you through your income tax returns or whizz you round a simulated Silverstone.

On the business side we start you off with a free disc which introduces you to the Amstrad CPC 6128's impressive range of capabilities, and the best ways to exploit them.

You'll discover how its massive 128k memory can open the door to over 8,000 CP/M* applications.

Programs like 'Wordprocessing' and 'Database' will file and index records, produce standard letters, mailing lists and even compile reports.



There's a series of business control programs which form a complete invoice, stock control and statement system.

In other words it's easy to choose the software you need to take the big problems out of your small business.

But even if you don't own a business there are plenty of good reasons for owning an Amstrad CPC 6128.

It makes short work of the problems we all face. Like keeping track of rates, mortgage and H.P. payments.

However even software packages as comprehensive

42

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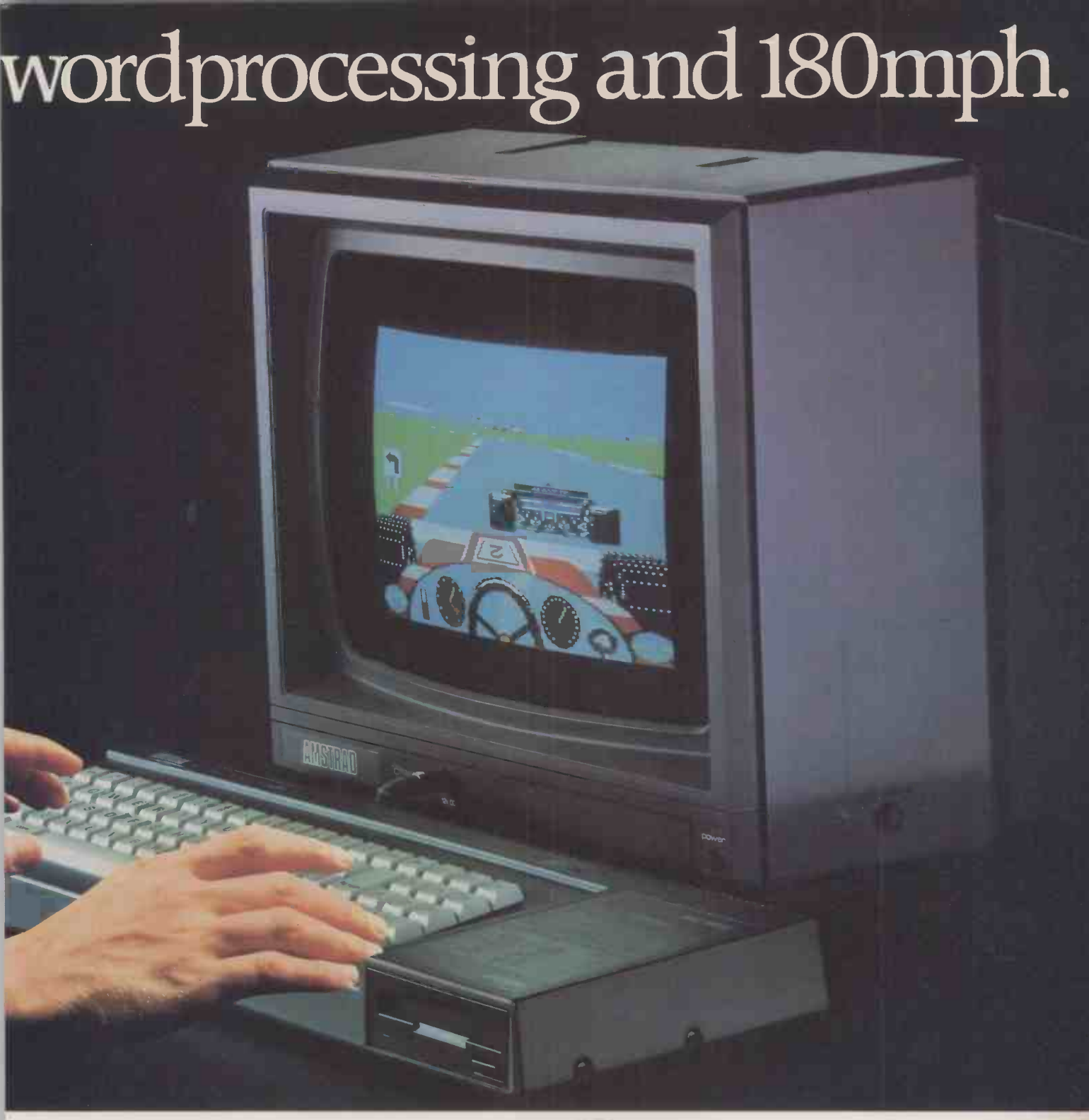

as Amstrad's are only as good as the hardware they're loaded into.

You need a complete system.

That's why the Amstrad comes complete with a built-in disc drive as well as a monitor (green screen or full colour). So it's ready to go to work as soon as you get it home.

And if you want to go further additional disc drives, printers and joysticks are all available to ensure that your computer can grow with your growing needs.

Finally there's one feature of the Amstrad CPC 6128 that's both good business and a pleasure: the price.

With Green Screen around	£299
With Colour Monitor around	£399

PC16128/2

Tell me more about the Amstrad CPC 6128

Name_____

Address_____

Amstrad CPC 6128 with 128k memory

Who says business and pleasure don't mix?

Amstrad P.O. Box 462, Brentwood, Essex CM14 4EF.

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10 MB Winchester disk. E.T. MEMORY we call it. But we don't mean from another planet, we mean more memory for earthly beings. Yet another extra that's standard. As are the extra benefits of the Canon Computer Club. Newly launched to give you still more value.

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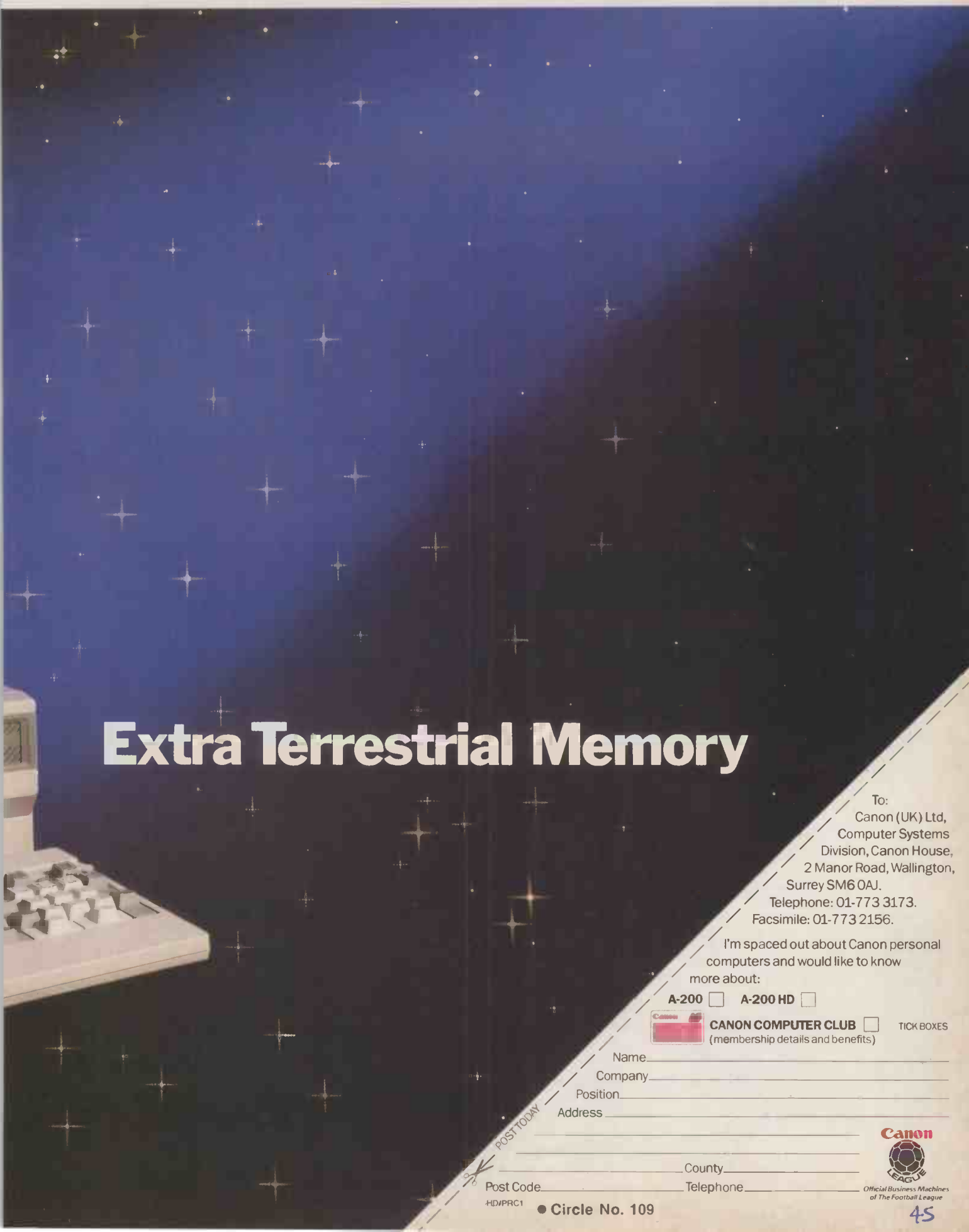

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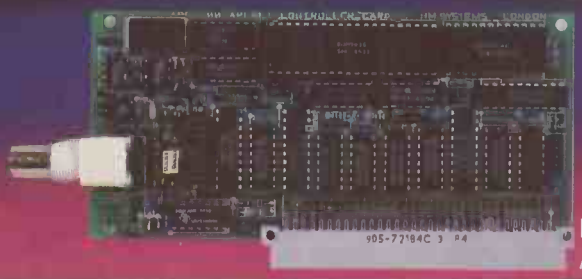

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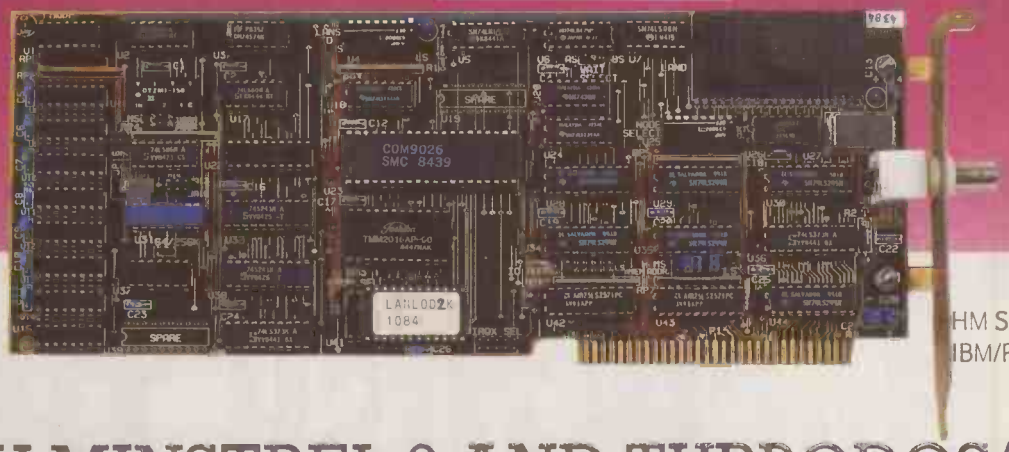

HM SYSTEMS
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WITH MINSTREL 2 AND TURBODOS/PC

Have you noticed how the mention of the word "network" makes some PC owners (and dealers) reach for the medicine cabinet?

We did. So we looked at the problem and, quite frankly, can't see what all the fuss is about. Then again, we are multi user systems specialists. Networking is our business, and has been for five years.

All you need is a fast file server, network processors and a magnificent networking operating system, we decided.

(The last item is the most important, and the most difficult to achieve.)

Fortunately, we had a head start. HM Systems use TurboDOS 1.41 in a close coupled multi processor network in Minstrel 2, our multi user system. TurboDOS is arguably the world's most widely used networking software, with over 50,000 installations worldwide, since its introduction in 1981.

TurboDOS/PC allows any PC running MS DOS versions 1.x, 2.x, 3.x, to share resources of a TurboDOS network. File locking is integral to TurboDOS.

Network interface is through Arcnet. You use co-ax cable to make the physical links, and Minstrel Arcnet cards for your IBMs, Apricots or IBM lookalikes.

This gives your PCs cheap, quick access to large amounts of disk storage and shared resources – which is what networking is all about. Your PCs can access lots of printers and other peripherals along the way. TurboDOS has sophisticated automatic print spooling, which cuts down queuing time.

As a guide to pricing – A four user Minstrel 2 IBM/PC file server with 20MByte Winchester will cost around £7,000.00. A twelve user version with 64MBytes hard disk costs £14,355.00. Plus cables and excluding PCs of course. Extra users cost £595.00.

A twelve user Apricot file server with 64MByte Winchester disk will cost around £11,775.00. Extra users cost £410.00 each.

MINSTREL 2. DESIGNED AND BUILT IN BRITAIN

Proven software, sturdy hardware, file locking, automatic spooling and a fast transfer rate add up to a network that works. Headaches aren't part of the package.

Write or call us for a chat. At the same time, ask about the Minstrel 2 multi user system – you can link your PCs into that as well. We'll be glad to show you how.

† TurboDOS™ Registered trademark of Software 2000 Inc.

IBM/PC is a trademark of International Business Machines Inc
Apricot is a trademark of ACT plc.
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HM Systems

TurboDOS power for multi-user networking

MINSTREL 2

Designed and built in Britain

It's not easy to build an effective multi-user system.

It takes experience, confidence and, above all, a superior operating system.

HM Systems possess all three qualities in large supply, and we've put them into Minstrel 2, our latest model.

Experience has shown that multiple workstations and resource-sharing call for multi processor architecture. That way, every user gets their own computer and performance doesn't suffer.

Confidence comes from using proven S100 technology. We've seen too many systems fail by being based on "next year's industry standard". We'd rather settle with this year's working solution. Wouldn't you?

Which is not to say that we're behind the times.

Our state of the art HTS 86 dual processor card was developed to provide two 16 bit computers on a single board.

This means 16 bit computing power at 8 bit prices for you.

We simply prefer evolutionary to revolutionary development.

Make no mistake, any multi user system is only as good as its operating system. Minstrel 2 uses TurboDOS® We've not come across a more flexible and powerful tool.

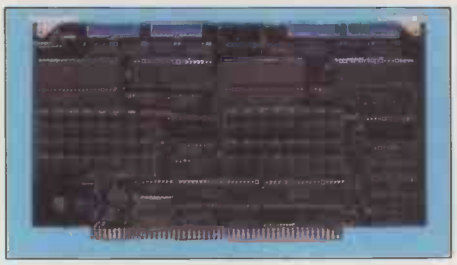
TurboDOS reads programs written for CP/M II,† CP/M 86, MP/M II, MP/M 86, has PC DOS emulation, and allows IBM PCs or lookalikes to share the resources of a Minstrel 2 system.

Networking is integral.

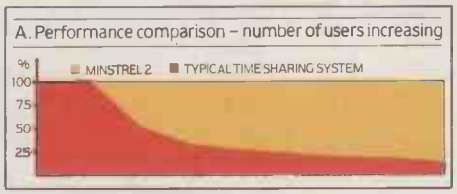
Minstrel 2 can communicate with all leading mainframes. And we can prove it.

Entry cost for a two-user system with 20Mb hard disk capacity is £6250.00. Additional workstations cost £1110.00 inclusive.

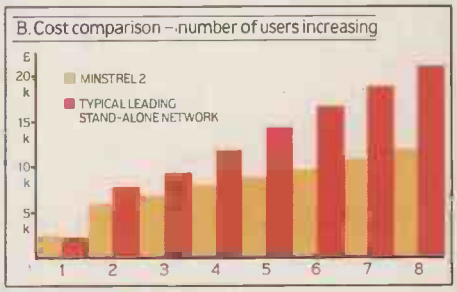
Write or call for a full colour brochure. You won't get a hard sell. With experience, confidence and the best operating system, we find the facts speak for themselves.



HM Systems HTS 86. 16 bit performance at 8 bit prices.



Costs rise and performance suffers when a number of terminals share a common processor. Graph B shows a network of leading stand-alone computers when compared with Minstrel 2. Graph A shows the effect on performance of timesharing compared with Minstrel 2.



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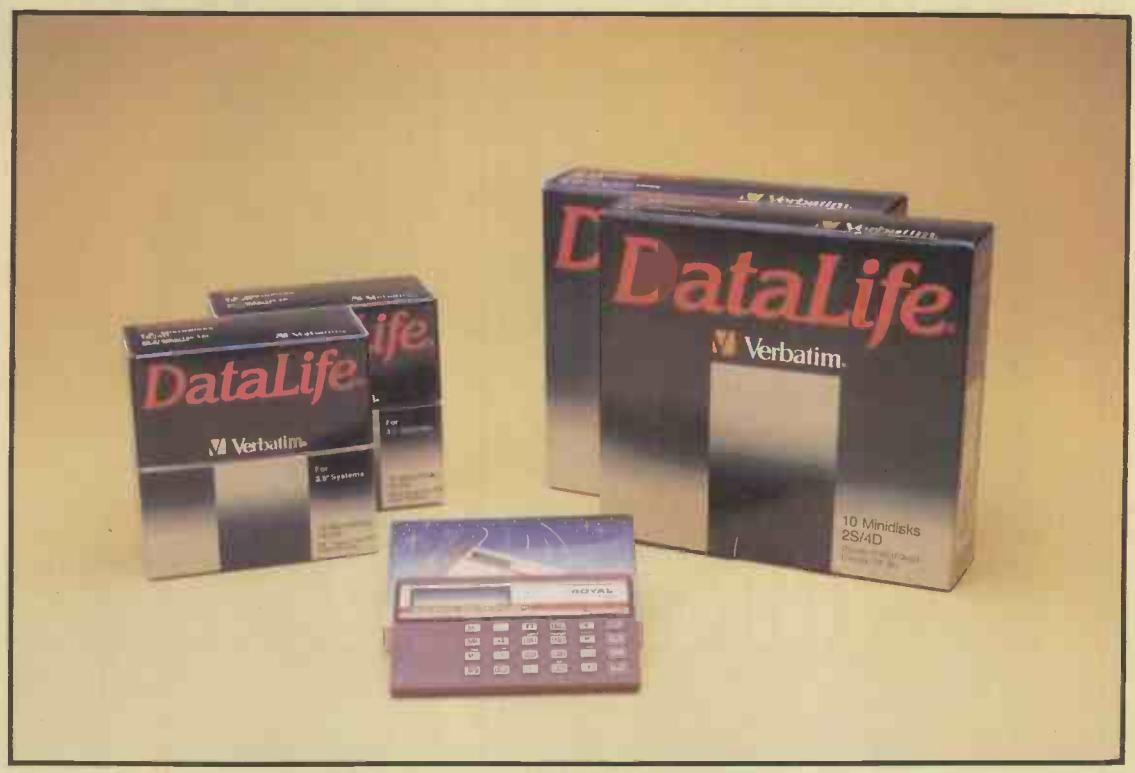

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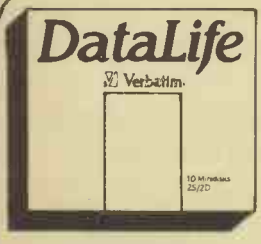

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204/2D D/S 96 tpi	34.90	32.90	31.90	30.90	29.90

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BY RAY COLES

PACKING IT IN

DEC's independent approach to systems design has kept it a step ahead in the microprocessor market.

Last month I used up a lot of space bemoaning the fate of the British semiconductor industry and its generally lacklustre showing in developing and successfully marketing high-performance microcircuits.

People in other countries obviously find this strange. Seeing a rich vein of scientific, technological, and engineering talent left unmined in these islands, they are more than happy to stump up the cash to make use of it for their own purposes.

One of the latest overseas corporations to announce plans for a semiconductor fabrication facility in the U.K. is the Digital Equipment Corporation, maker of the ubiquitous PDP-11 and Vax range of minicomputers.

DEC can rightly claim to be one of the trailblazers for the microprocessor revolution. Not, paradoxically, because of its semiconductor chip technology, but because of its computer architecture and its whole approach to computing.

STARTING SMALL

DEC began back in 1957, making prefabricated transistor building blocks for other computer manufacturers to use in their mainframe computers. But by 1959 it had introduced a low-cost computer of its own, the PDP-1, costing only $120,000. Other models followed, and in 1965 DEC changed the face of computing by launching the first true minicomputer, the PDP-8, which lived in a fairly small cabinet and included 4K words of memory, for just $20,000.

From then on it became possible for the computer to go to the job, rather than the job go to the computer, and DEC produced its budget-priced machines by the thousand. You could have any word length, so long as it was 12 bits, and you did not have to have an air-conditioned temple to put it in. PDP-8s started to appear in factories, offices, and schools: a new philosophy of computing had been born.

The follow-up to the PDP-8, the 16-bit PDP-11, was even more successful. It is still very widely used today thanks to a respected CPU architecture and instruction set which many early microprocessor designers did their best to emulate.

When 16-bit microprocessors became possible, DEC knew exactly how to react to this potential competitor. It joined in the semiconductor business and built a PDP-11 based on LSI chips, the LSI-11 of the mid-seventies. The first LSI-11 needed three 40-pin chips for the CPU and was much less powerful than its bigger siblings, which then ranged from the basic PDP-11-34 to the very powerful PDP-11-70, all of which were based on discrete TTL logic circuit boards.

MINI ON A CHIP

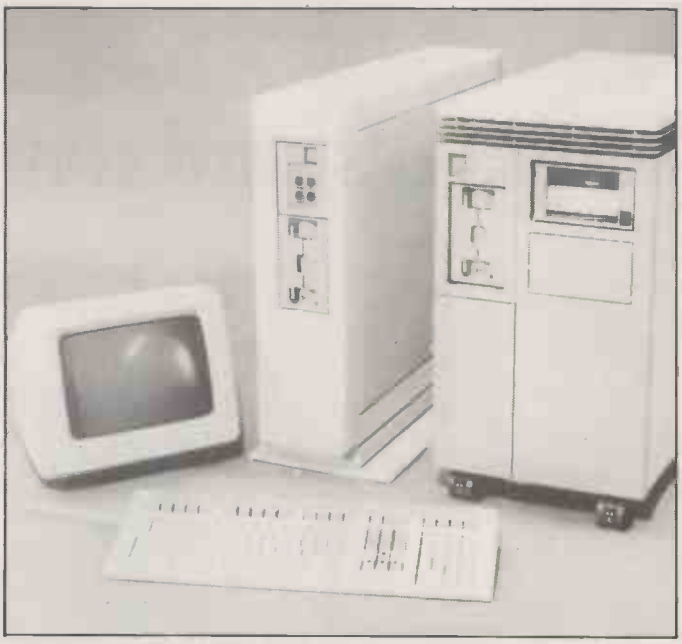
Although the first LSI-11 chips relied heavily on the manufacturing skills of other semiconductor companies, notably Western Digital, DEC was determined to do the whole job itself. So by the early eighties it was manufacturing the CMOS T-11 microprocessor, a single chip with roughly the power of a PDP-11-34, closely followed by the J-11 with the power of an 11-70.

DEC used these chips in its own systems and later sold them separately as components for other manufacturers to use. Consequently it beat the major chip manufacturers at their own game and ensured that the PDP-11 architecture and instruction set would become an industry standard for all time.

Meanwhile, back in 1978 DEC had launched another more powerful computer family: the Vax 32-bit machines. They were initially billed as midicomputers but are now accepted into the general classification of minis. The Vax brought virtual-memory technology within reach of the small computer user, and by keeping to the successful formula of inexpensive, reliable systems with complete family compatibility, DEC produced another winner.

32 INTO ONE

In 1985 it has now become possible to put even a 32-bit virtual-memory processor on to a single chip of silicon. The leading semiconductor manufacturers, notably National Semiconductor with its 32032 and Motorola with its 68020, now have their devices ready. Unfortunately for them perhaps, so has DEC with its 78032 chip providing a complete emulation of the formidable Vax 11-780 processor.



The Microvax II is built around DEC's own 78032 chip and approaches the power of the Vax II/780 mini.

As a result, Motorola and National have had to spend a lot of money wooing potential users and software vendors to support their chips. Meanwhile DEC managed to hit the ground running, with a captive and very eager market already lusting after their "new cheap Vax" which could run all the old software.

In traditional style, DEC is selling the chips in ready-to-go systems initially, leaving the marketing of bare chips until later. This is the exact opposite of the approach taken by the semiconductor houses. No wonder DEC is so successful.

DEC now needs a new semiconductor design and fabrication plant, and has decided to build it at a place called Butlaw, near South Queensferry, Edinburgh. The new site will cover 86 acres and will include a chip-manufacturing building covering 200,000 square feet and supporting 400 new jobs in 1988 when the plant is on-stream. DEC already has a major investment in Scotland at its 650-strong Ayr facility, where the volume production of LSI-based micros is undertaken.

START TO FINISH

Together with the recent commissioning of a new VLSI chip test and packaging facility at Ayr, the Butlaw plant will provide DEC with the ability to build computers from raw silicon to the finished product entirely in Scotland. The plant will be capable of designing and building the most advanced chips, like the 78032 processor now used in the Micro Vax II. This remarkable device provides the computing power of a Vax 11-780 CPU from a single package about 1in. square.

It features 16 32-bit registers, 31 interrupt levels, and a memory-management unit capable of mapping up to 1Gbyte of physical memory into a 4Gbyte virtual-memory space. When linked with the 78132 floating-point chip it will directly execute 245 out of a possible total of 304 Vax instructions, the others being emulated in software.

The plant will be able to fabricate 6in. wafers and will feature state-of-the-art double-metal CMOS technology which will be used to implement proprietary DEC chip designs. PC

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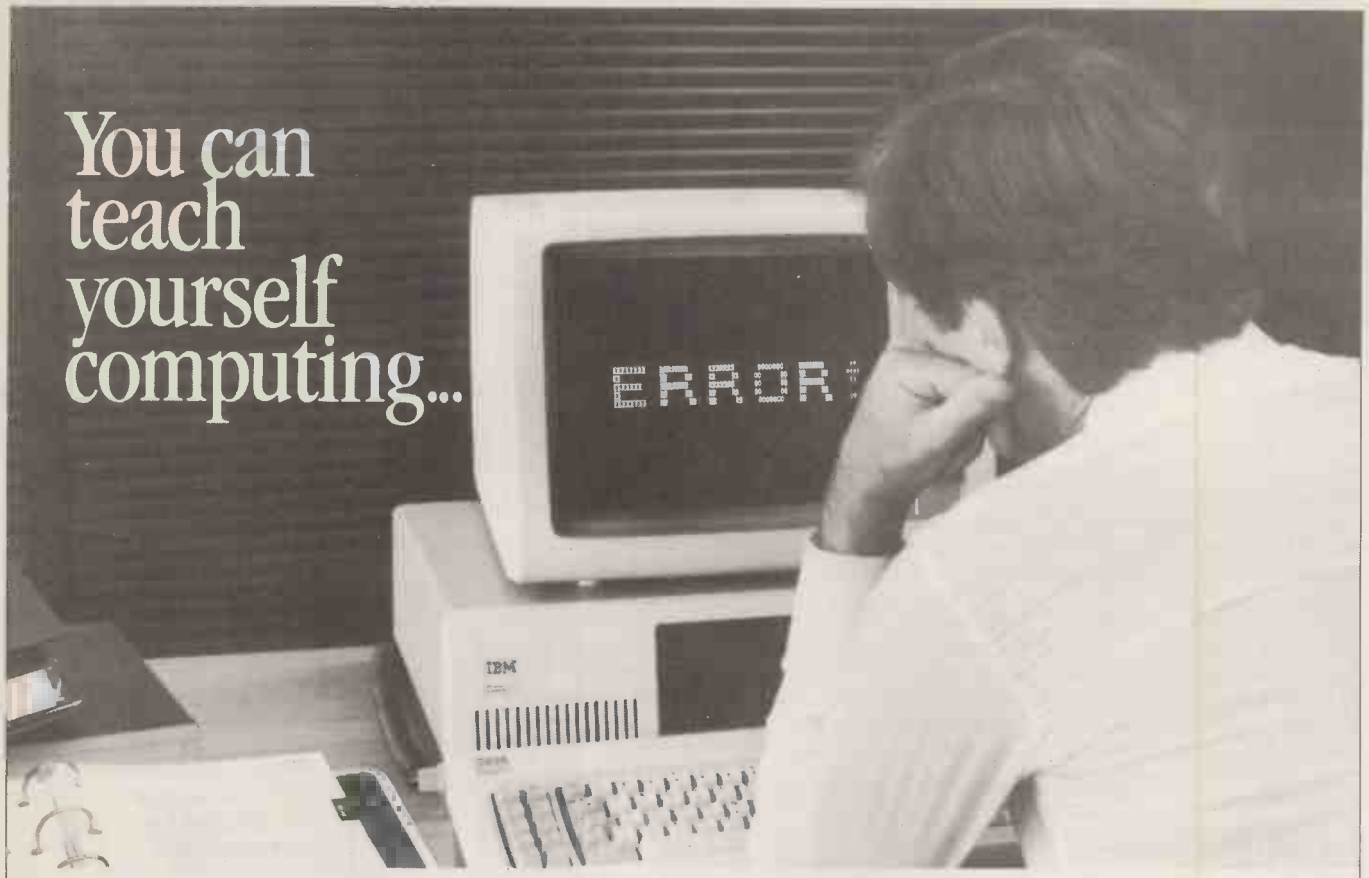

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BY MIKE LEWIS

BIG SORTS

There is more to sorting a really large file than just scaling up the standard techniques.

If there is one commodity that programmers have in abundance, it's good sorting algorithms. Entire books have been written on how to put data into sequence, and some of the better-known techniques have even found their way into Software Workshop. These include Shell's sort in July 1984, Quicksort in December 1984, and radix sorting in February 1985.

These methods all have one thing in common: they are intended for sorting tables. But what do you do if you need to sort, not a table, but a large file? "Large" in this context means too big to fit into RAM.

It is tempting to assume that an algorithm which efficiently sorts 1,000 members of an array can be adapted to sort 50,000 records on disc, just by changing table accessing to file accessing. But disc I/O is not only a great deal slower than table handling, it also presents problems of its own — like the need to minimise head movement — which in-memory sorts are just not designed to handle. A sort which takes a minute in RAM might take hours when applied to a disc file.

Instead, most file-sorting methods — or "external sorts" as they are often called — use a divide and conquer approach. They work by splitting the file into smaller RAM-sized chunks, sorting these separately, then merging them together. Any of the familiar algorithms can be used for the sorting phase. The clever part is to choose the most effective method of merging.

One way of doing this is the traditional four-tape sort/merge. This technique grew in popularity in the early 1960s, when the typical data-processing computer had four magnetic-tape units, very little internal memory and almost certainly no discs or other direct-access backing store.

The method starts by reading two records from the input tape, then outputting them in sequence to work tape 1. Repeat with the next two records, but this time write them to work tape 2. The third pair go to tape 1 again, the next to tape 2, and so on for the rest of the input file.

Now rewind all the tapes and remove the input file. Next, read tapes 1 and 2, merging the first two records from each to produce a run of four records which are written, in sequence, to work tape 3. Now produce another run of four on tape 4. Continue in this way, alternating between the two output work tapes, until both the work files have been completely merged.

The next step is to merge the four-record groups on tapes 3 and 4 to produce runs of eight, these being written alternately to tapes 1 and 2. And so it goes on, flip-flopping between the two pairs of work tapes, doubling the size of the sorted runs each time. On the final pass, two of the tapes each contain half the entire file, which are finally merged to the eventual output tape.

This technique requires a lot of I/O, but it has the important advantages of using virtually no internal memory, and of perfoming all its reading and writing on sequential files. These factors were important in the algorithm's heyday. On today's micros, RAM is plentiful and disc drives are a far more familiar sight than tape units. Nevertheless, the classic four-tape sort/merge can be used as the basis of an algorithm which is more in tune with modern hardware.

The routine just described started, in effect, by sorting a table of just two elements, which were

(continued on next page)

AN EXTERNAL SORT/MERGE

The multi-way sort/merge needs a RAM table and a number of work files. If the table holds N records, up to 2N files are used. In this example, we will sort 38 records, these being the characters (ignoring spaces) that make up the following phrase

EXTERNAL SORT EXAMPLE FOR SOFTWARE WORKSHOP

The table size is 4, and the sentinel value is a caret, ^, which has a higher value in the ASCII collating sequence than any of the capital letters.

First, the records are read into the table four at a time, then sorted and written to files 1 to 4. The sentinel is added to each run of four. At the end of this phase, the files contain the following:

File 1: EETX^ EFLP^ HKRS^
File 2: ALNR^ OORS^ OP^
File 3: ORST^ AFTW^
File 4: AEMX^ EORW^

The first records from each of these files are now read back into the table, and the lowest one is written to file 5. Its place in the table is taken by the next record from the file from which it came. The new lowest one is then found and this is also written to file 5. The process is repeated until the lowest record is a sentinel.

From file				To file
1	2	3	4	5
E	A	O	A	A
E	L	O	A	A
E	L	O	E	E
E	L	O	E	E
T	L	O	E	E
T	L	O	M	L
T	N	O	M	M
T	N	O	X	N
T	R	O	X	O
T	R	R	X	R
T	^	R	X	R
T	^	S	X	S
T	^	T	X	T
X	^	T	X	T
X	^	^	X	X
^	^	^	X	X
^	^	^	^	^

The first 16 input records are now on file 5, in the correct order. The next 16 are similarly merged to file 6, and the final six to file 7:

File 6: AEEF FLOO OPRR STWW^
File 7: HKOP RS^

Finally, files 5, 6 and 7 are merged to file 1, which now becomes the final output file:

Output: AAAE EEEE EFHK LLMN OOOO OPPR RRRR SSST TTWW XX^

SMARTKEY

Of the many new software packages that have arrived on my desk over the past few months, one of the most useful is Smartkey, a keyboard-configuration program for IBM, MS-DOS and CP/M-80 systems. It allows you to assign character strings to around 400 different one- and two-key combinations, the strings being of virtually any length. Unlike most other programs of this type, Smartkey holds the specified characters in a buffer, to be released as and when the program needs them. This means that you could use a single keystroke, for example, to load dBase II, enter the date, alter the default drive, change several other parameters, and run a command file. As well as the usual Shift, Control and Alt combinations, Smartkey allows you to assign a further key as a Supershift.

All interaction with Smartkey is by means of a pop-up window which does not destroy what was on the screen before. You can therefore change the key assignments from within a program without spoiling the screen. You can also store the key definitions in a text file, or you can go into Record mode to capture on disc any sequence of keystrokes.

Smartkey was written in Australia by FBN Software, and distributed in the U.K. by Caxton Software, 10-14 Bedford Street, London WC2. Telephone: 01-379 6502. The price is £99 for the IBM version and £79 for the rest.

(continued from previous page)

output to the same number of work files. But there is nothing to stop you from increasing the table to a larger size, N, with N output work files on the first pass and 2N work files in all.

So how do you merge a large number of files together? The first record of each file is fed into RAM, where it is conveniently held in the same array that was used for the internal sort on the first pass. This array is then searched for the smallest entry, written to the first output file, and replaced with the second record from the input file from which it came. It then looks for the smallest entry again, and writes this to the same output. The process is repeated until the first run of N from each work file has been merged and we have a run of N^2 on file N + 1.

As the sort proceeds it produces further runs of N^2 sorted records on files N + 2 to 2N, then runs of N^3 on files 1 to N, and so on until the sort is complete. To understand the details better, try working through the example in the box, which is based on a manageable table size of N equal to 4.

Although any suitable method may be chosen for the initial sort phase, the technique known as binary insertion is particularly attractive. This involves putting the table into sequence at the same time that it is being loaded from the file. As each new record is read, its position in the table is found, the record is inserted, and all subsequent records are moved down one place. An advantage of this approach is that it makes use of any existing order in the data.

In the merge phase, a small problem crops up when searching for the smallest entry in the table: how does the program know when it has come to the end of a run of records on a given input work file? It could, of course, keep a set of decrementing counters, one for each file, but these would need another N-sized table, occupying space that could be better employed for the main sorting area.

SEARCHING PROBLEM

The answer is to append an extra record to each run, with a key that is higher than the highest possible key in the actual data. This sentinel record is written to the file as a kind of End of Run marker, then read back on the next pass.

As the input runs become exhausted, the table will fill up with these high values. Each merge can be considered complete when a search for the lowest table entry returns the sentinel value. This record is then written — one copy only, not the entire table — to the current output, ready for the next time round the loop.

Another problem is to decide the best value for the table size, N. You might at first be tempted to choose the largest table that can fit into the computer's internal memory. This would mean larger pre-sorted runs, fewer merge passes, and therefore less I/O. True, it would also lead to more time spent on the first phase of internal sorts, but this is practically guaranteed to be faster than the input and output of the later stages.

Unfortunately, a large table also means a large number of work files. Each file involves an overhead for directory access, file opening and closing, buffering, and similar factors. In some environments, this might even mean exceeding the maximum number of files that the operating system can support.

One way round this problem would be to hold the work files, not as separate entities, but as subsections of a smaller number of physical files. Since you will always know the lengths of these subfiles, it is an easy matter to calculate their offsets within the actual files.

The disadvantage of this approach is that you lose the benefit of accessing the files sequentially. Data is generally transferred to and from disc in physical chunks, the size of which rarely corresponds to a logical record. When reading records that are close to one another, the operating system fetches an entire block from disc, then hands the records to the program as they are needed. But if you have to get records from all over the place, each one has to come with the rest of its block, so you end up doing far more I/O than would otherwise be the case.

BEST TABLE SIZE

By now it should be clear that tuning an external sort algorithm depends as much on the mechanics of the operating system as on the nature and volume of the data being sorted. The best table size for a system running under CP/M with 128-byte blocks might be quite unsuitable for MS-DOS environment with 512-byte blocks. Other factors, such as file fragmentation and disc caches, complicate matters even more.

In these circumstances, predicting the performance of an external sort is virtually impossible. Nevertheless, with a little trial and error, you should get reasonable results from the method outlined here. PC

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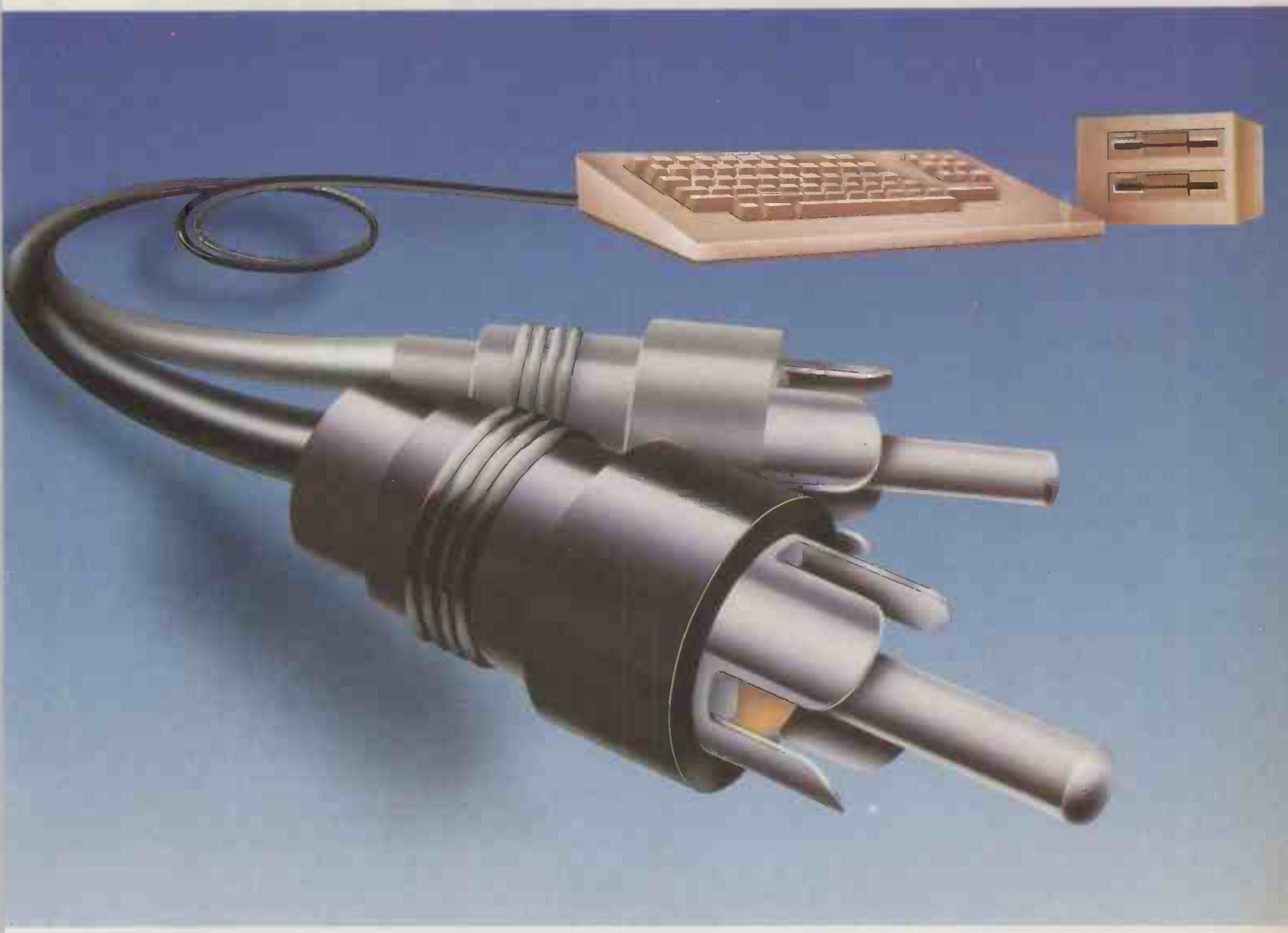

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BY BEN KNOX

ON-LINE ADVICE

News of the Online Information Centre.

If you know of any BBSs or other systems which you think would interest other readers, send me details either electronically to Prestel **Mailbox** 919993567 or **Telecom Gold** ID 84:TCC051.

With the vast number of databases which are currently available for accessing information on virtually any imaginable subject, it is not surprising that people are often very confused as to which services they should link in to and how they should be using them.

The Online Information Centre was set up in 1979 to act as a source of information about on-line services. The Centre was originally funded by the Department of Industry and The British Library Research and Development Department. In March of this year, Aslib, the Association of Information Management, took over responsibility.

The Centre produces a newsletter, offers an enquiry service and publishes a number of books and guides. The newsletter is called Online Notes and is published monthly. All the news which is relevant to users of on-line systems is covered under a number of headings.

New and Planned Databases covers comprehensive details of any new databases. Hosts and Producers gives information and news about the companies which provide the computer equipment on which databases reside, and the suppliers of information. Host Review is where one particular information service is looked at each month. The review includes a rundown of the files available on the system, the charges, details of the commands which can be used, and generally how easy it is to get to the information which you require. Telecoms gives details of additions of new nodes to data networks and other changes. Equipment gives details of new hardware and software available to people going on-line. Other News covers anything which does not fit in elsewhere. Forthcoming Events covers shows, meetings, conferences and seminars. Training Courses gives details of the courses held by many of the companies which provide on-line services. Books covers recommended books and newsletters for the on-line user.

In addition to the newsletter, the Online Centre publishes a number of booklets. Some look at the various database services available for people who are interested in particular subjects: for example, Medical, Patents and Law.

The *1982 Survey of U.K. Online Users* gives interesting details about people's on-line habits and the services they use.

For example, only 26.1 percent of the survey respondents accessed Prestel at all, whereas 87.1 percent had access to a large U.S. database system called Dialog.

One of the centre's publications I can highly recommend for everyone with an interest in getting information from databases is *Going Online*. The book gives full details of how to decide which databases you require, working out the costs, how to keep searches economical, and step-by-step instructions for linking up.

Finally, the Centre provides an enquiry service which can offer help on any aspect of on-line information retrieval, from the equipment you require, to advice on efficient searching techniques.

Altogether, the Online Information Centre is an invaluable source of advice and information to the on-line community, and with an annual subscription costing only £30 — £40 for overseas — it is cheap too.

Further information on these services can be obtained from The Online Information Centre, Aslib, The Association for Information Management, Information House, 26-27 Boswell Street, London WC1N 3JZ. Telephone: 01-430 2502.

THE GNOME AT HOME

Number: 01-888 8894
Sysop: Micrognome
Times: 24 hours
Speed: 1,200/75 baud
Format: viewdata

The Gnome at Home is the first multi-user bulletin board running in Britain. At the moment, up to two users can be on-line simultaneously. The board is run by the group of people who make up the company Softmachinery.

Once on-line to The Gnome at Home you are presented with a Welcome page and asked to type in your name and something else about yourself. This task completed, you are directed toward the main menu which offers nine options.

Latest News covers news about the system, and the computer world. Communicado covers communications-related information and news. Beebomania offers news related to the BBC Micro. Gnome Diary offers random jottings about the system. Underware gives system information. Goblin Party offers selections of the best message to appear on the system over the past months. Write to Gnomey for users' comments. Goblination gives miscellaneous information, news and gobbledegook. Babble Board is where users may leave and read messages. There are four sub-topics: Babble, Trivia, Politics, Dwarf's. Messages are put on the system about a minute after they are sent.

As well as keying page routes — as on Prestel — on The Gnome at Home you can also enter commands. These are in the format *<COMMAND># . This is not really a command as such, you just go to the page which has the name <COMMAND> and the information you requested is displayed.

Two such commands are Who and When. Who displays who else is on the system. Although there only two lines into The Gnome at Home, Who displays more than two users. In the Who directory these extra users will often all have the name Autognome. Autognome is not really another user, but a monitoring program which keeps an eye on how long you are spending on the system, updates the Babble area and generally keeps the system running smoothly.

Autognome will usually make its presence known before that. On logging on to The Gnome at Home you will receive messages at the bottom of your screen welcoming you, and telling you how long you should stay.

When is a page which tells you about the usage of the system. A graph is displayed showing how much the system was in demand for the previous week. With the graph you can work out when you will have the best chance of getting on the system. The amount of time you are allowed on the system is connected to the demand on the system when you call. If the second line is free, then you will be allowed to stay on virtually as long as you like. If both lines are in use, you will be given less and less time as you go into a busy period of the day.

The Gnome at Home is based on a heavily modified version of Communitel software running on BBC Micros which are on a Econet local area network. The network file server is from SJ Research and has 3.2Mbyte of floppy-disc storage — 1.6Mbyte of which is used for The Gnome at Home.

Each BBC Micro is connected to a Dacom auto-answer modem which is in turn connected to a phone line. The Autognome monitor program is run on two more BBC Micros which are also connected to the net. Using the net to run the Gnome at Home makes it very easy to add more users since you just add more BBC Micros/modems to the network.

The Gnome at Home team hope to get a 30Mbyte hard disc later this year. This will enable them to add features such as passwords for all users, mailboxing, multi-user chatting and perhaps a multi-user game.

The number of users which can access the system at the same time will increase as soon as British Telecom fits extra telephone lines, and when the Gnomes at Home can get hold of more BBC Micros. At the moment everything is paid for by Softmachinery. To finance the expansion schemes, a charge may be introduced to certain areas of the system, such as the multi-user game when it is introduced.

The Gnome at Home is probably the most advanced BBS operating in Britain today. The system is well maintained and it is obvious that a great deal of work has been put into it by the people who run it. PC

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BY DAVID LEVY

JUST BLUFFING

How to program three-card Brag.

MIKE GORNELL

Brag is a very much simpler version of poker, and is enormously popular in Britain. It probably derived from a game called primero, which was popular in Tudor times, and is more about knowing and understanding your opponents' play than about odds and calculation. Anyone who wishes to become a good poker player would do well to learn Brag first. I studied the subject during my first year at university and found the experience immensely rewarding.

The game is played with an ordinary deck of 52 cards, and is most fun if there are four players or more. The dealer puts in the smallest stake as an ante, and then deals three cards face down to each of the players. The players then bet, and the betting continues until there are only two players left in the pot.

From this point onwards either player may do three things. First, he may simply bet an amount equal to or greater than the previous player's bet. In this case it is now the turn of the other player. Second, he may bet the amount of the previous player's bet and say: "I see you" — this is known as calling the bet. In this case the player with the best hand wins all the money in the pot, but if both players have exactly the same value hand, the player who said: "I see you" loses the pot. Third, he may fold, in which case the player throws in his cards and the remaining player wins the hand.

BETTING RULES

The exact rules about the betting vary slightly from one Brag school to another. As taught at St. Andrews University the size of a bet had no upper limit — it was a friendly game and one assumed that it was unsporting to try to win more than a term's grant money in one night. The disadvantage of playing in no-limit games is that if you do not have more money than everyone else at the table, you might be forced to quit a hand that you want to play or to write out a cheque that you cannot afford to meet. For this reason we used to play table stakes, which means that you can never lose more money on a hand than you have on the table.

For a computerised Brag game each bet should have an upper limit. This might be the amount of money already in the pot for that hand — this is called pot limit — or it might be half of the money already in the pot. The former makes the game exciting without it being able to get out of hand. However, the size of a pot can rise amazingly quickly: the dealer puts in £1, the next player can bet £2, the next £4, and if everyone puts in the maximum bet the size of the pot doubles each time.

The rankings of the hands can also vary slightly from one school to another. A prial — three cards of the same denomination — is the best type of hand to be dealt. We used to rule that three 3s was the top hand of all, then three Aces, three Kings, and so on, down to three 2s. Next in ranking is a running flush which, as in poker, is three successive cards of the same suit. The top running flush when I played was Ace, 2, 3, then Ace, King, Queen, then King, Queen, Jack, etc. You need not differentiate between the same running flush in different suits, but if you wish to you can use the same priority as in bridge: spades is top, then hearts, diamonds and clubs. Examining the probabilities of being dealt each type of hand, it is clear that a prial is actually dealt more often than a running flush, since there are 52 possible prials as against 48 possible running flushes.

After a running flush the next best type of hand is a run, which is three successive cards but not all in the same suit. Once again Ace, 2, 3, was the top run, then Ace, King, Queen. Next comes a flush, which is three cards of the same suit. If the two players at the showdown both have a flush, the tie is broken by the one with the highest card — Ace counts high. If there is still a tie the second highest card decides, or if necessary, the third highest. After a flush the next best type of hand is a pair, with two Aces counting above Kings, Queens, etc. If no one has even a pair, the hand is won by the player holding the highest card, with ties broken by the rank of the second highest or, if necessary, the lowest card.

The only information a player can extract about his opponents' hands is the amount of money that the others are willing to bet. In draw poker at least you know how many cards the other players draw: for example, someone who takes four cards is unlikely to have been dealt two pairs or three of a kind, and is just as unlikely to end up with a straight or a flush. In stud poker you get an opportunity to see some of your opponent's cards, so you are able to determine what his best possible hand can be.

WATCH AND WAIT

But in Brag there is no information at all. You must try to watch carefully how your opponent bets, and on those occasions when he stays in to the end of the pot you can see his cards and remember how he bet during the hand. After a while, if you are a good player, you will learn something about the psychological makeup of your opponents, and you will then be better able to judge the strength of their hands from the way they are betting.

There are 22,100 possible different hands that can be dealt at three-card Brag; 52 prials, 48 running flushes, 720 runs, 1,096 flushes, and 3,744 pairs. The probability for each type of hand is as follows: prial 0.24 percent, running flush 0.22 percent, run 3.26 percent, flush 4.96 percent, pair 16.9 percent, and high card 74.39 percent. The probability that a player is dealt a running flush or better is 0.46 percent, that he is dealt a run or better is 3.72 percent, a flush or better is 8.68 percent, and a pair or better is 25.62 percent.

You must devise some way for your program to estimate where on this scale the hand of each of your opponents is most likely to be. This can be estimated partly from the raw probabilities presented here, partly from the amount of money they are betting on the hand, and partly on the known history of the players' betting styles.

Suppose the program is playing in a game with four other players, and is dealt a top flush of Ace, King, Jack. This hand wins unless one of the opponents has a run or better, and the probability that none of the other four players will have a run or better is given by:

$$(1-0.0372)\times(1-0.0372)\times$$
$$(1-0.0372)\times(1-0.0372)=0.86$$

so in the absence of any other information there is an 86 percent chance that the program holds the best hand.

The next stage is to modify the probability estimates according to how a player bets. If a player has bet a total of 100 times the dealer's ante since the start of the hand, you will take him far more seriously than if he has bet only three times the dealer's ante.

The maximum amount that a player may bet at any stage is the amount of money currently in the pot, P. The minimum amount

(continued on next page)

(continued from previous page)

that he may bet is the same amount as the previous player's bet, B. The program can compute how far along the range from B to P a player's bet lies. If a player bets B then his range score for that bet is set to the minimum, which is 2. If he bets P then his range score for that bet is set to the maximum, 4, and if his bet lies between B and P his range score for that bet will be linearly interpolated between 2 and 4. So if his bet is

$$B+(P-B)/4$$

his range score for that bet will be set to 2.5.

To use the range score another variable is introduced for each player's hand, called the hand assessment. It starts life at the beginning of the hand with a value of 100. This indicates that the program assumes the player's cards to be in the top 100 percent of possible hands, which is true. When a player makes a bet the program immediately computes the player's range score for that bet, and divides the current value of his hand assessment by the new value of his range score. If a player makes the maximum bet at his first opportunity, his range score is set at 4 and his new hand assessment is 25, that is 100/4. A player who is first to bet after the deal may only bet the amount of the ante, so if he does bet, his range score is set to 3 for that bet only.

Now that he has a hand assessment of 25, the player is assumed to have one of the best 25 percent of hands, which means that he is assumed to have at least a pair. If he bets the minimum on his next bet the player's hand assessment is reduced to 12.5, that is 25/2, and he is still assumed to have at least a pair. But if he bets the maximum again then his new hand assessment becomes 6.25 percent.

If the program were to assume that nobody bluffed, it would stay in the hand until one or more of the players had a low enough hand-assessment value, indicating that the program did not hold the strongest hand, and then it would fold. But bluff is an essential ingredient of Brag, and so the program must monitor the way that its opponents bluff. To do this, use another variable — the bluff factor — for each player.

At the start of a session everyone has a bluff factor of 1, a value which indicates that the program assumes the player never to bluff. At the end of a hand, if a player is involved in the showdown his cards are seen by everyone, including the program. It is then possible for the program to determine how many of his bets during that hand were bluffs — that is bets giving rise to a hand-assessment value which did not correspond to the player's true holding.

For example, if a player made a bet which resulted in a hand assessment of 25, indicating at least a pair, and he held only an Ace high, the program would count that as one bluff. The program then computes the number of bluffs per bet for that hand, and adjusts the bluff factor for the player in question by using the formula:

new bluff factor = (0.8 × old bluff factor) + (0.2 × (1 − number of bluffs/number of bets))

A bluff factor of 0 indicates that a player bluffs all the time. A value of 1 indicates that he never bluffs. The bluff factor is used in conjunction with the range score. The two are multiplied together and the resulting product is used — unless it is less than 1, in which case it is assumed to be 1 — in place of the range score, to determine the new value of the hand assessment.

The program now knows enough about the other players to make its decisions when there are at least two opponents remaining in the pot. If any of the other players has a hand assessment indicating that the program does not hold the best hand, it should fold. Otherwise it should bet a random amount between the minimum and maximum legal stakes, just to keep the opposition confused.

When the number of players in the pot is reduced to two, the strategy becomes slightly more complicated. If the program believes that it holds the stronger hand it should continue to bet a random amount generated on the range between the minimum legal and maximum legal bets.

However, if the remaining player's hand-assessment value suggests that the program is losing, it should make its betting decision by computing what percentage of hands are better than the program's holding and dividing this percentage by the remaining player's hand-assessment value. If the result is less than the value of money already in the pot divided by the amount the program needs to put in to call the last bet, then the program should call.

If the program does not call the last bet it must then decide whether or not it is going to bluff. It does this by randomly generating a number of the range 0 to 1, and this number is less than half the other player's current bluff factor, the program should bet an amount randomly generated between the minimum and maximum legal bets. PC

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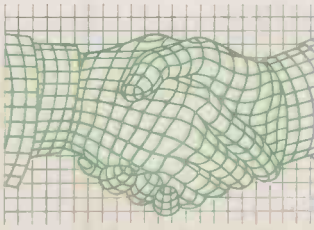

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ATARI ST

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POWER WITHOUT THE PRICE

THE NEW ATARI 520ST

Under the new leadership of Jack Tramiel (former boss and founder of Commodore Business Machines), Atari Corporation have marked their entry into the world of business/personal computers with a machine which leaves the competition standing. Tramiel's slogan 'Power Without the Price' has been implemented in the manufacture of the new 512K Atari 520ST colour computer which offers the user amazingly high performance at an incredibly low price. Launched as a work-station, this new system incorporates seven software packages as well as the 520ST computer with 512K RAM, mouse controller, high resolution monochrome monitor (640x400), 95 key keyboard (with 18 key numeric keypad), MIDI interface, GEM and a 500K 3½ inch disk drive, all for the package price of only £651.30 (+VAT = £749). Dubbed the 'Mac beater' and the 'Jackintosh' (after Atari's Chief, Jack Tramiel), Atari's new machine has been directly compared with the Apple Macintosh RRP £2595 (+VAT = £2985) which offers similar features and capabilities but at a much higher price. Favourably reviewed by the UK's highly critical specialist computer press, the 520ST is likely to make a great impact in this country as a sophisticated alternative to an IBM PC, APRICOT or APPLE MACINTOSH. Unlike its overpriced competitors, the Atari 520ST can be linked up to a colour monitor to unleash a choice of up to 512 colours. The addition of colour brings out the full potential of graphics packages such as GEM.

USER FRIENDLY GEM OPERATING SYSTEM

The power of the ST is harnessed and made user friendly by the new operating system 'GEM' from Digital Research. GEM stands for Graphics Environment Manager and allows a user friendly colour or B/W graphics interface which closely resembles that of the Macintosh. This similarity extends to the use of moveable resizeable windows, icons to represent objects such as disks and disk drives, and the use of pull down menus and a mouse. The advantage of all this is that the computer becomes extremely easy to use. GEM has now been implemented for the Acorn, ACT, Atari, IBM, ICL, and Olivetti. Software written for GEM on one computer should also run under GEM on another computer. This will enable the market to quickly produce a large library of standard interchangeable software.

FREE SOFTWARE AND FUTURE EXPANSION

The Atari 520ST comes supplied with seven free software packages as listed below. 1) TOS -Tramiel Operating System based on CPM 68K. 2) GEM Graphics Environment Manager by Digital Research (DR) giving a WIMP (Window, Icon, Mouse, Pull down menu) environment. 3) DR GEM Paint for creating graphics masterpieces. 4) DR GEM Write for word processing. 5) Logo learning language to enable you to write your own programs easily using turtle graphics. 6) DR Personal Basic a powerful user friendly version of the Basic programming language. 7) BOS operating system giving you access to dozens of business applications packages already available on the market. Designed with future expansion in mind, the ST also features a host of different interfaces to the outside world and an impressive list of accessories is planned. Atari will soon be releasing a 1000K (1MB) 3½ inch disk drive, and a 15MB hard disk storage system as well as a mass storage compact disk (CD) player capable of storing an entire 20 volume encyclopedia on one disk. A full range of inexpensive printers are planned including dot matrix, daisywheel and thermal colour printers. With its unbeatable graphics, speed and software at a price which is far below that of any comparable personal computer currently on the market, the ST is all set to do battle with the competition. To receive further details of the ST from Silica Shop, just fill in the coupon below with your name and address details and post it to us.

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ATARI 520ST SPECIFICATION

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GEM WIMP ENVIRONMENT
WIMP - Window Icon Mouse Pop-down menus
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Icons/Pull down menus/Windows
GEM VDI - Virtual Device Interface
GEM AES - Application Environment Services
GEM BBT - Bit Block Transfer
Real time clock & calendar

SOFTWARE
GEM environment
with user friendly Macintosh style operation
'TOS' - Tramiel Operating System
Atari's own system based on CP/M 68K with hierarchical directory & file structure plus a host of MS DOS & UNIX command structures
'BOS' - Business Operating System
to run any standard BOS business programs
GEM desktop
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June 1985 - Jack Schofield - PRACTICAL COMPUTING

FEATURES OF BASIC SYSTEM	APPLE MACINTOSH	APRICOT F1ø	ATARI 520ST
Price includes B/W Monitor	YES	NO - extra £200	YES
Keyboard size mm (LxDxH)	330x147x50	450x167x28	470x240x80
Keyboard size ins (LxDxH)	13x5¾x2	17½x6½x1	18½x9½x2½
3½" D/Drive (Unformatted)	500K	500K	500K
3½" D/Drive (Formatted)	399K	315K	349K
WIMP (Window, Icon, Mouse ...)	Apple	ACT - Activity	GEM
Real-time Clock	YES	YES	YES
Polyphonic Sound Generator	YES	NO	YES
RS232 Serial Port	YES	YES	YES
Centronics Parallel Printer Port	NO	YES	YES
Dedicated Floppy Disk Controller	NO	YES	YES
Hard Disk DMA Interface	NO	YES	YES
Full stroke keyboard	YES	YES	YES
Number of keys on keyboard	59	92	95
Numeric Keypad	NO	YES (16 Keys)	YES (18 keys)
Cursor Control Keypad	NO	YES	YES
Function keys	NO	10	10
16-bit processor	68000	Intel 8086	68000
Processor running speed	8MHz	4.77MHz	8MHz
RAM size	512K	256K	512K
Number of graphics modes	1	4	3
Number of colours	Monochrome	16	512
Max Screen Resolution (pixels)	512 x 342	640 x 256	640 x 400
Mouse included	Single Button	NO - extra £95	Two Button
Replaceable External Power Pack	NO	NO	YES
Cartridge Socket	NO	NO	YES
Joystick Ports	NO	NO	YES (two)
MIDI Synthesiser Interface	NO	NO	YES
Monitor Size	9"	9" - extra £200	12"
RGB Video Output	NO	YES	YES

System Cost with: Mouse - Monochrome Monitor - 512K RAM - 500K Disk Drive

Price of basic system (exc VAT)	£2595+VAT	£595+VAT	£652+VAT
+ Mouse	Included	£95+VAT	Included
+ Monochrome Monitor	Included	£200+VAT	Included
+ Expansion to 512K RAM	Included	£295+VAT	Included
Price of complete system (exc VAT)	£2595+VAT	£1185+VAT	£652+VAT
PRICE rounded down including VAT	**£2,984**	**£1,362**	**£749**

PRESS COMMENT

"Atari's new corporate image as an aggressive low cost computer maker is likely to mirror that of Commodore where Mr. Tramiel established the maxim that 'Business is war'."
August 21st 1984 FINANCIAL TIMES

"This is the only personal computer I know of that comes with a Midi interface as standard."
Peter Bright March 1985 PERSONAL COMPUTER WORLD

"The (GEM) version running on the Atari 68000 machines will have the additional advantage of leaving the PC version standing."
April 6th 1985 PERSONAL COMPUTER NEWS

"It would seem that GEM offers the ideal operating system."
March 7th 1985 POPULAR COMPUTING WEEKLY

"I found it (GEM) extremely easy to use and was very impressed with the way in which it disguises the unfriendly hardware and operating systems lurking under the surface."
Peter Bright Feb 1985 PERSONAL COMPUTER WORLD

"The electronics in the machine are a work of art ... The heart of the 520ST is a Motorola 68000, one of the most powerful 16-bit processors around and in many respects it is close to being a 32-bit chip ... when the machine appears in the shops, I'll be at the front end of the queue to buy one."
Peter Bright June 1985 PERSONAL COMPUTER WORLD

"This machine is significantly more powerful than an IBM PC ... If it's possible to design a sure-fire winning machine, this is it."
May 11th 1985 PERSONAL COMPUTER NEWS

"... the use of GEM makes the new range of Atari computers so similar to the Macintosh (with the added attraction of colour), that they are already being called 'Jackintoshes'."
May 2nd 1985 COMPUTING

"The new Atari ST computers truly represent to the consumer what Jack Tramiel is saying — easy-to-use computing power without the price."
March 1985 ANALOG COMPUTING

"It (the ST) uses the most modern technology that is affordable, in a package that gives a professional impression."
May 23rd 1985 POPULAR COMPUTING WEEKLY

"The Atari ST is one of the most elegant designs I have seen ... Atari has used an original and elegant method of memory management which should make the ST faster than any other PC on the market - in any price bracket ... The 64K dollar question is would I go out and spend money for one? To which the only answer is 'Try and stop me!'"
John Lambert July 1985 ELECTRONICS & COMPUTING

"The 520ST is technically excellent ... The 520ST hardware is the new standard by which others will be judged."
July 1985 YOUR COMPUTER

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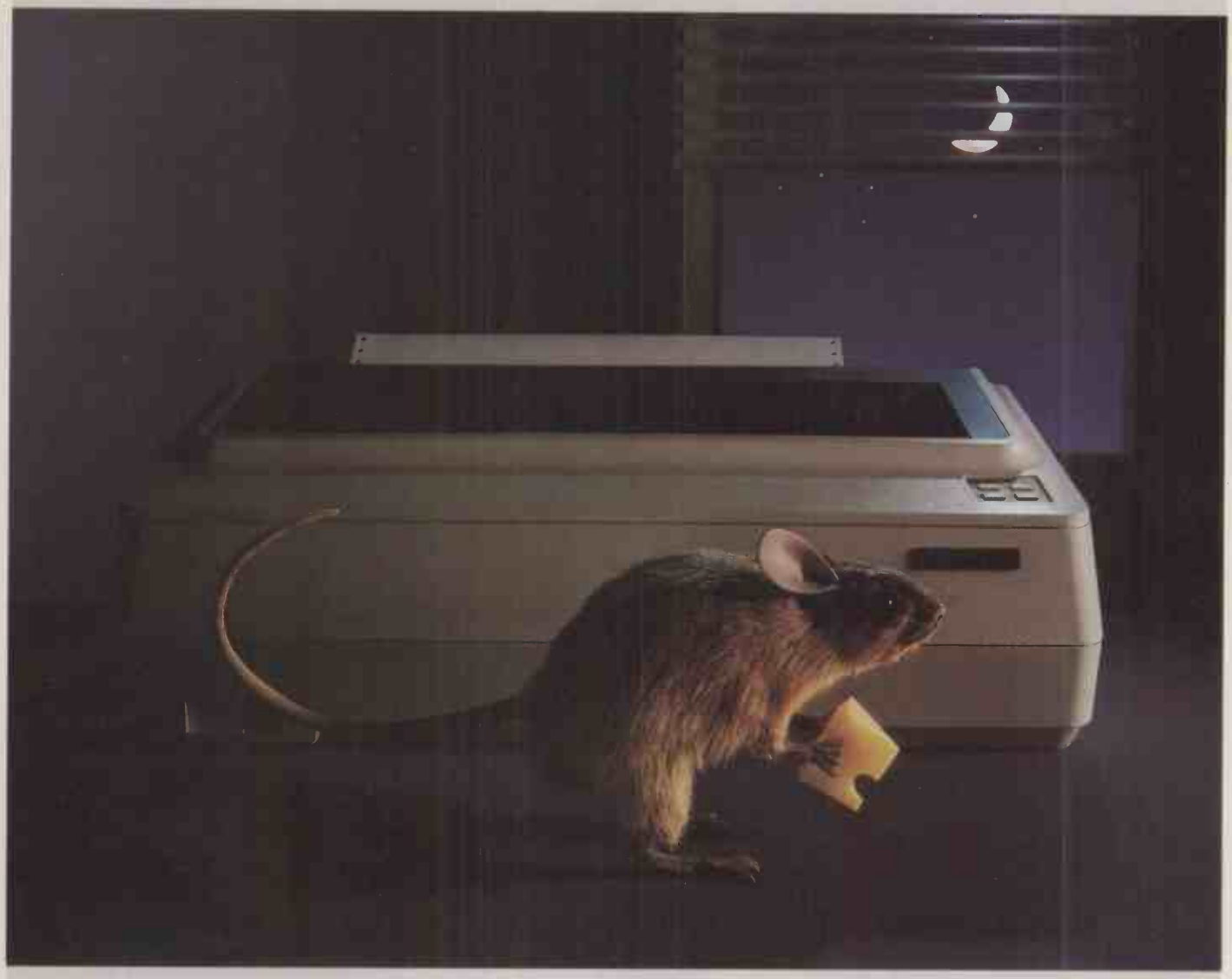
The New MT 85/86 printers are as quiet as a...



Take a listen to the new MT85 and MT86 serial matrix printers. They're amazingly quiet. Which makes their performance definitely something to shout about.

The MT85 is a compact 80 column printer, while the MT86 offers a full 136 column width. Both print high speed draft output at 180 cps. And high quality correspondence at 45 cps in various typestyles. Then there's compressed, expanded and bold print for even more variety. And of course graphics.

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INTERVIEW

IANN BARRON — Founder and Director of Inmos

INTERVIEWED BY GLYN MOODY

Iann Barron was born in 1936. He attended Cambridge University, where he gained a double first in mathematics and philosophy. After a spell in the Army Operational Group and Fighter Command, he joined Elliott Automation as a computer designer. In 1965 he set up Computer Technology Ltd, Britain's first minicomputer manufacturer. In 1978, together with Richard Petritz and Paul Schroeder, Barron founded the chip-maker Inmos, with substantial public funding provided by the Labour administration. This interest was sold off by the government to Thorn EMI in 1984. As well as producing a variety of RAM chips, Inmos has been working towards the launch of its revolutionary Transputer — a name derived from "transistor/computer". Shipment of production quantities of the Transputer is imminent.

Whose idea was the Transputer?
I ORIGINALLY proposed the idea of a computing component which could be put into arrays, with broadly the properties the Transputer now has, before Inmos was actually started.

Did you have a clear idea of what you wanted to do?
I HAD a clear idea of what I wanted to do — but nobody else did.

What is the most revolutionary aspect of the Transputer?
THE MOST revolutionary aspect is concurrency. The idea that rather than expressing programs purely sequentially, it would be nice to have systems in which one can write a program which allowed various parts of the calculation to go on at the same time. A single Transputer is a von Neumann architecture machine. So we do it by cheating, as it were — by taking the concurrent parts of the program and time-sharing them. And then we have the capability to put together many Transputers to get real concurrency, in which the various parts of the program are executing on different Transputers. Putting all of the detail in to make it work correctly induces enormous overheads in current architectures, whereas a Transputer has got all that kind of thing right and so is very efficient.

What applications is the Transputer particularly well suited to?
WE'VE DESIGNED it so that it can be used as a component; we've also designed it so that it can be used as a conventional microprocessor. Broadly speaking, a Transputer will address all the other applications of any other microprocessor. Where it will be competitive is in those applications which require a lot of performance, because it is faster than the competing microprocessors.

When production begins, will it be just a dribble or more substantial?
WE'RE A BIT better off than your average microprocessor when it starts, because quite a lot of people want to build an array. Where with a new microprocessor you might expect to sell one to a customer and he engineers it into a prototype, we can be selling a hundred or more.

Have you fixed a price?
WE'RE QUOTING $500. The pattern of microprocessors at the moment is that they tend to drop from the introductory price, which is up in the few hundred dollars, down to $50, $30 and then stay stable. The processor part is only a corner of the chip, so our processor is actually very small in comparison with the 68020 or the 386. What hhat says is that we can make versions which are just processors, which could be very much lower-cost. This is something we would clearly like to do — introduce commodity Transputers. I think you'll find them turning up in cars.

Do you see the Transputer as the first of the next generation of processors?
I'M NOT SURE of the extent to which it will be used in conventional computer applications. A lot of those have got locked-in software, and I think that that is quite a difficult market for us to tackle. But as an example, we are producing a board-level product for evaluation purposes which is an IBM PC plug-in board. It plugs in and gives you a megabyte of memory and a Transputer. And the Transputer is going 10 times as fast as a 286 so it really gives you a turbo IBM PC.

Are other people working on rivals to the Transputer?
INTEL in the U.S. has got this thing called the Cosmic Cube built out of 8086s. That came from Caltech, and Caltech does have designs which are somewhat similar. Fairchild says it is actually making a transputer, but we know nothing about it.

What future developments are planned?
WE CAN carry out a number of variations on the theme we have at the moment. We can slot in different sizes of memory, different numbers of communication channels, different interfaces. We are developing the next-generation technology, and will build Transputers in that which will go faster, and have significantly more memory capacity but be the same sort of thing. We're developing a floating-point Transputer — not a co-processor. Then we have ideas about fifth-generation Transputers, basically a component which will support much more dynamic languages.

In the light of Inmos's recent troubles, how confident are you about the future?
IT'S JUST a bad time in the market at the moment. We've basically rather a nice portfolio of products. We've got good resources behind us: we don't have qualms about the future in that sense. The real thing is to look not at the present but at the future, and ask which companies have products which the market is really going to want. Because those are the ones which are going to be successful. The question is, is the market going to want the Transputer? We think so; we've got to convince the market. PC

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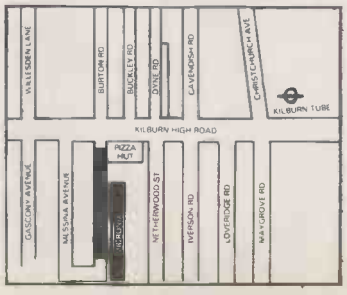

Q I am trying to obtain a program called Modem 7, some information about it, and how to use it. I would like to use this communications package on an Osborne and an Epson. Also, do you know of a source of the program for an IBM PC?

M R STANNARD

A Modem 7 is a communications program for CP/M-80. It was originally written in 1977 by Ward Christiansen for the American PMNI modem. Several people have since altered the original program. First it was extended by Mark Zeiger and James Mills in 1980, who unfortunately removed the original comments while adding the terminal file, batch mode, and probably some more bugs. In 1981 Paul Hansknecht added CRC check sums. In 1983 David R Back produced an improved and debugged version for the U.K. and renamed it UKM 7.

The source code for UKM7.ASM and the documentation UKM7.Doc are available from the CP/M Users Group Library; contact Diane Fordred, Secretary to CPMSDOSUGUK, 72 Mill Road, Hawley, Dartford, Kent DA2 7RZ. An IBM version of Modem7.Com running under PC-DOS or MS-DOS, along with the documentation Modem7.Doc, is available on disc 4 of the IBM PC Users Group, PO Box 593, London SW1V 2PG. Since the UKM 7 files run to four line-printer pages of documentation and 49 pages of code you would be well advised to join the users group and buy the disc, rather than trying to type it all in for yourself.

Q I know someone who accidentally formatted his hard disc, thus destroying the data and programs stored there. I too run a hard-disc system with floppies for backup, so I have to run a formatting program to format new discs. Is there any way of ensuring that this program does not wipe the hard disc?

L MARTIN

A Your letter provides a timely reminder that careless use of the Format program can erase the entire contents of a hard disc. It is essential to keep a program to format floppy discs, though when you have a hard disc you will probably not use it very frequently. The problem with the Format program is that you either specify which drive you want to format by typing a letter after the Format command, or if the letter is omitted it asks which drive contains the disc to be formatted. If you type the wrong letter, your hard disc will be formatted and there is no way of stopping it.

A hard disc may be installed as drive A, drive B or drive C, depending on the particular machine. Similarly, you may have one or more floppy drives, so the letters for the drives vary from machine to machine. Assuming that you have a floppy drive as drive A and the hard disc as drive C, it is likely that you will want to format discs in drive A, and unlikely that you will want to format drive C. You do not say whether you are using a machine running PC-DOS or MS-DOS, or one running under CP/M; the procedure is slightly different for the two operating systems.

We would not keep the program Format.Com on a hard disc. Instead we would rename Format.Com with a different name that carries a warning about its function — for example Killdisc.Com or Destroy.Com — and save this on the hard disc.

To allow floppy discs to be formatted in drive A, but not drive C, use the editor or your word processor to set up a batch file called Format.Bat to do this. The file called Format.Bat contains two lines:

```
ECHO OFF
KILLDISC A:/S
```

Now when the Format command is typed, Format.Bat will be executed. It runs the Killdisc program, but the drive is specified as A, so it does not allow you to choose which drive you want to format. Thus it is impossible for anyone to make a mistake and ruin the hard disc on drive C. The /S option in the second line of Format.Bat is used to copy the operating system on to the new disc, and may be omitted.

Under CP/M the Submit command will run a batch file, but it is not very easy to use and the simplest solution is to rename Format.Com as before and to run Killdisc when required.

WINCHESTER SECURITY

Q I have been considering the problems of using an IBM PC with a hard disc. A floppy-disc model holds less data, but would seem to be much more secure since system and data discs can be taken out and locked away safely. With a hard disc anyone can start up the machine and read confidential information stored on the discs. Even worse, someone might alter or destroy the data. Is it possible to get security and a large amount of disc storage at the same time?

S MILNER

A The ability to remove and lock away sensitive or confidential information is important in many sorts of work. Nowadays most floppy discs store about 360K, and the trend is towards storing even more — 1.2Mbyte, for example, on the IBM PC/AT, and a massive 2Mbyte on the Commodore 8296. For many purposes this sufficient.

You can obtain a higher level of security by encoding sensitive information, to make it more difficult to read unless you have the appropriate decoding program. There are numerous cryptography programs around, and we will mention just two. The IBM PC Users Group has a data-encryption package called PC Code, which is available to members at the nominal price of £5 from PO Box 593, London SW1V 2PG. An inexpensive commercial product called Off the Record costs £34.95 from P&P Software; telephone (0706) 217744. It will work with hard discs or floppies.

Though hard discs are usually fixed inside the casing of a computer, demountable types are also available which have cartridges containing the magnetic surfaces that can be removed and locked away. Bernoulli drives are another possibility, though a rather costly one at present — see *Practical Computing*, October 1985, page 106.

Neither encryption nor locking discs away offers complete protection against a disgruntled employee who just wants to erase the file or otherwise do damage. We have heard of a program called Lockit, which offers some security for data on a hard disc by preventing anyone booting the machine without the necessary password. Lockit costs $130 from Security Microsystems Consultants, 16 Flagg Place Suite, Staten Island, NY 10304, U.S.A. Remember that, given time and opportunity, passwords can be broken, and it is best to change your password regularly. It is also a good idea to avoid expletives and girls' names, as these are usually the first things tried by most hackers.

It would be quite easy to write your own Autoexec.Bat file that handles a sequence of operations at boot-up. For example, you could make it read a password typed from the keyboard, then read a file containing the password you have stored and perhaps quit or disable the keyboard or make an awful noise if the two do not match. But in practice this approach is useless. Anyone who knows a little computing will just press Control-C after the system has booted and before you have to type the password, thus stopping the Autoexec sequence. The message

Terminate batch job (Y/N)?

is displayed by MS-DOS or PC-DOS, and if your villain answers Yes he or she is into the system, bypassing the password routine.

This is an important subject, and this magazine would be pleased to hear from readers who have brilliant or working ideas.

? · ! · ? · ! · ? · ! · ? · ! · ? · ! · ? · ! · ? · ! · ? · !

Q I shall require a new typewriter soon, and in about a year I shall almost certainly need to invest in a small computer and printer. Possible uses are freelance journalism, producing magazines, translations and possibly mail order. I don't want to spend a lot of money on a typewriter now, only to discover next year that I could have bought a machine that would integrate into my computer setup. Could you point me in the right direction?

J WITTY

A Some of the Brother range of typewriters have an RS-232 plug which may be connected to a computer. You can use the typewriter to input information to the computer, and the computer can print information on the typewriter. It can also be used as a free-standing typewriter. You can get information on Brother machines from Jones + Brother, Shipley Street, Audenshaw, Manchester M34 5JD. Telephone: 061-330 6531.

There are two points you should bear in mind. First, typewriters are much less robust

(continued on next page)

(continued from previous page)

than computer printers, and so we would prefer a proper printer. Some of the near letter quality (NLQ) dot-matrix printers give acceptable-quality printing. Daisywheel printers give the best printout, and you can choose the typeface from hundreds of different daisywheels, but they are slow. The second point to watch is that not all computers have an RS-232 plug. Many have a parallel port, and if this is the case you must choose a printer with a parallel plug.

Q **I need a computer for serious mathematical work. I have read with great interest the information on the HP 75 computer with the maths PROM, and it appears to be excellent. However, its cost, plus that of the essential peripherals and software, put it outside the range that I was contemplating. Is it possible to get decent numerical accuracy without going to so high a class of machine?**

P G REDGEMENT

A The Hewlett-Packard HP 75 is interesting, has a powerful range of maths functions including matrix handling, but it is rather expensive.

It looks as if you are not going to get your matrix functions in Basic, and you may have problems over getting sufficient figures accuracy too. If you use Microsoft MBasic, you only get six decimal figures accuracy in your calculations, unless you use double precision — in which case you get 16 figures accuracy. Six figures is not really enough, while 16 seems to be overkill which uses a lot of memory and runs slowly. Remember too that the trig functions only work to six-figure accuracy regardless of whether you use double precision or not.

I solved the problem of getting sufficient accuracy from Basic several years ago, by using Micro Mikes Bazic, which runs under CP/M-80. This is syntactically the same as North Star Basic, but has been written in Z-80 machine code, which runs faster than programs written in 8080 machine code. The main differences in syntax between this and Microsoft's MBasic are in the use of substrings. The file handling is also different — and better, if you want to use random-access files.

Apart from the increased speed of operation, four different versions of Bazic are supplied to give eight, 10, 12 and 14 significant figures accuracy respectively. You get all four, and can choose which one you need for a particular program. While testing you may use the eight-figure version as it runs fastest, and then use the 12- or 14-figure versions for serious calculations.

MBasic stores numbers in true binary, which inevitably causes rounding errors when storing some numbers. By contrast, Bazic stores and manipulates numbers in binary coded decimal (BCD). Using BCD, numbers are stored exactly, so there is no internal rounding of numbers. We got Bazic from Interam Computers at a cost of about £100.

Q **I would like to comment on the accuracy of powers of 10 obtained using Basic on a Sanyo MBC-555 and an IBM PC/XT. Both leave something to be desired when evaluating:**

```
A=10^N
```

if N exceeds 9 in single precision or 6 in double precision I know that I can enter 1D'N', but if 10^N is derived from within Basic I haven't found any reasonably simple way of doing so accurately. The best solution I have found is to split N in half, so that K + L = N. Then the expression

```
A#=10^K * 10^L
```

gives answers accurate to 16 figures. Is there a better way?

P A DUVAL

A Presumably you are using Basica on both machines, so we would expect both to behave the same. We confirmed your results on an Advance 86 and on an IBM PC running Basica, and obtained slightly different results using MBasic on a CP/M-80 machine.

Consider the simple program:

```
10 FOR I=1 TO 15
20      A=10^I
30      B#=10^I
40      C#=10#^I
50      D#=10^CDBL(I)
60      PRINT A, B#, C#, D#
70 NEXT I
```

Using Basica we obtained the exact answers in every case for the single-precision calculation; the double-precision calculations give the expected answers up to 10^10, but 10^11 is given as 99999997952 and all higher powers are slightly wrong.

It may initially seem to be the wrong way round that single precision gives the correct answer while double precision does not, but you should consider how the computer deals with raising numbers to a given power. In fact it uses the Log function to do this, and all intrinsic functions, including ^, in Microsoft Basic work in single precision, regardless of whether the argument used is single or double precision. Thus, regardless of your line of code, the actual calculation is only carried out in single precision.

The printed single-precision results are correct because Basic has printed the nearest single-precision decimal value to the number it has just evaluated. For example, the number evaluated by 10^7 is very slightly less than 10,000,000 and this is printed as a single-precision number at 1E7. If the same number is printed in double precision then the inaccuracy shows, and 9999999.999999995 is the result which is displayed.

Your method of getting accurate results by splitting N in half is a clever way of getting answers accurate to 16 figures. There is a better way if you are dealing with whole-number powers, since these can be obtained by multiplication in double precision, and so you can avoid the single-precision step of Log. If you are using the numbers often, set them up in an array:

```
10 DEFDBL X
20 DIM X(30)
30 X(1)=10
40 FOR I=2 TO 30
50      X(I)=X(I-1) * 10
60 NEXT I
70 REM PRINT VALUES
80 FOR I=1 TO 30
90      PRINT I, X(I)
100 NEXT I
```

Where you want to use these values in your program, instead of evaluating 10^N simply use the array element X(N).

Q **I run a small consultancy business in the food industry, and often have to supply substantial amounts of data to my clients. Telex is slow and expensive, so I am thinking of equipping my regular clients with a cheap micro/modem/printer setup. It would not be economic for them to subscribe independently to PSS, so I am thinking of sending data in real time, in a form which they can edit if necessary or dump as a permanent record. I use a Pet and an Osborne, both with RS-232 interfaces to a printer. If I could draw data from either or both of these and send it direct it would be fine, otherwise I will get another machine. Cost is important, and most of my client do not use computers at all so friendliness is paramount. It would be ideal if all they had to do was to turn on and put the phone into an acoustic coupler. Have you any suggestions or observations?**

ALAN VINCENT

A The simplest setup is for you and each of your clients to buy a computer and either a modem or an acoustic coupler. Using this equipment you could then phone the number of your client's modem, and use either a dumb terminal or your computer to control their computer. You could type information into their computer, or use terminal-emulation software to transfer files between your computer and theirs.

This solution is expensive to run because you use a BT voice phone line for all the time you are connected. You will, of course, have much smaller phone bills if you prepare your data on your computer then transfer the file to your client's machine, rather than typing directly into your client's computer, since the computer can transmit a file more quickly than you can type it.

Another possibility within the U.K. and in certain countries overseas is to buy space on Telecom Gold, the licensed version of ITT Dialcom. There is a £10 monthly minimum charge, but several or all of your clients could use the same mailbox as it is only necessary to give the password to gain access. You could then leave your data on the Telecom computer in this mailbox ready for your clients to collect.

But beware! Someone using a Telecom Gold box carelessly or maliciously can run up a very large bill. We strongly recommend that you keep one box for yourself, and get the others to agree to share the cost of a second box. Your clients would either need a computer or a terminal, plus a modem to receive or download text. A printing terminal would be better than a VDU, and some electronic typewriters are now capable of transmitting and receiving data through an RS-232 port. PC

In "Ask PC" **John and Timothy Lee** answer questions on any area of microcomputing. If you have a nagging problem, write to us, marking ASK PC clearly on the top left-hand corner of the envelope. Letters should contain one question only. We cannot guarantee a personal reply, but to be considered your letter must include your name and address, together with a stamped addressed envelope. The most representative questions of general interest will be answered and published.

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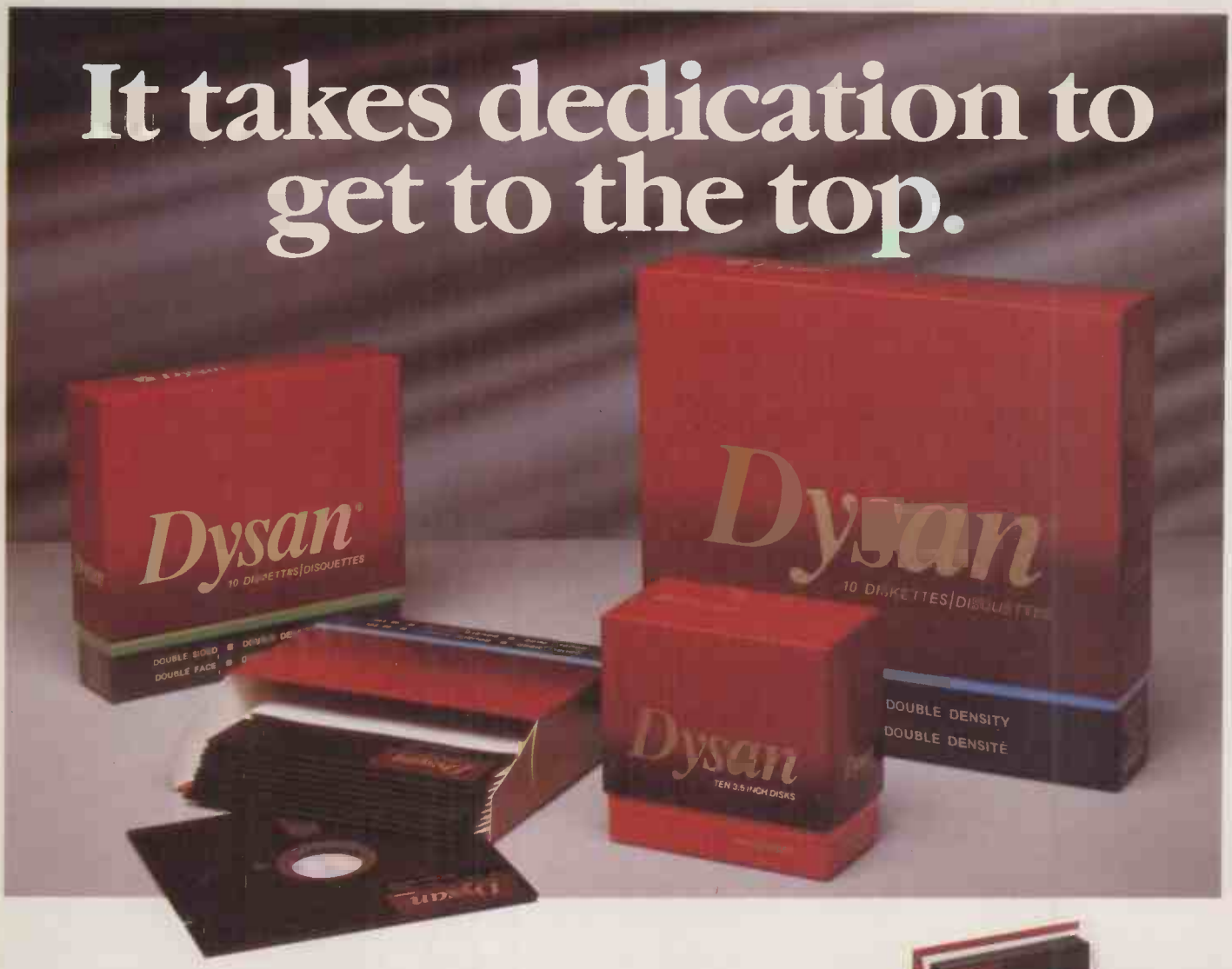

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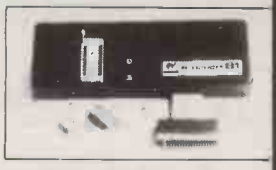

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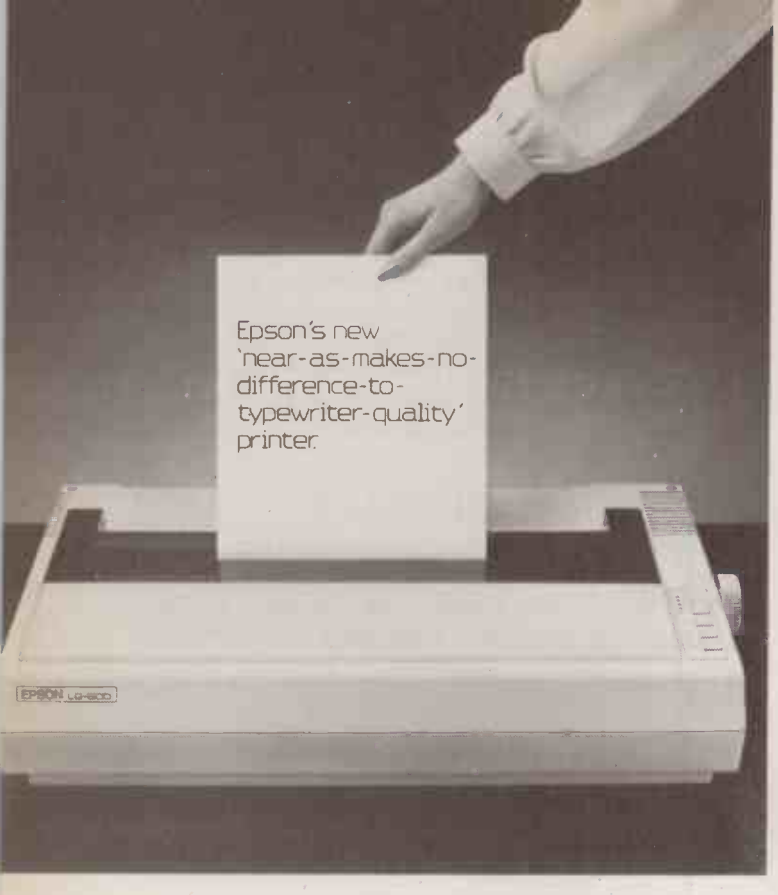

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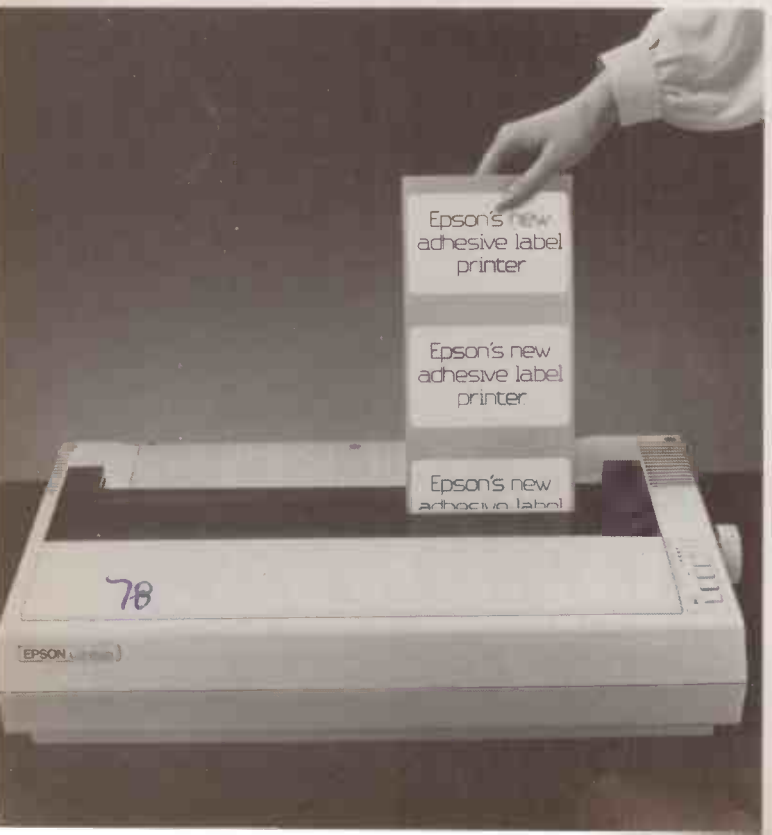

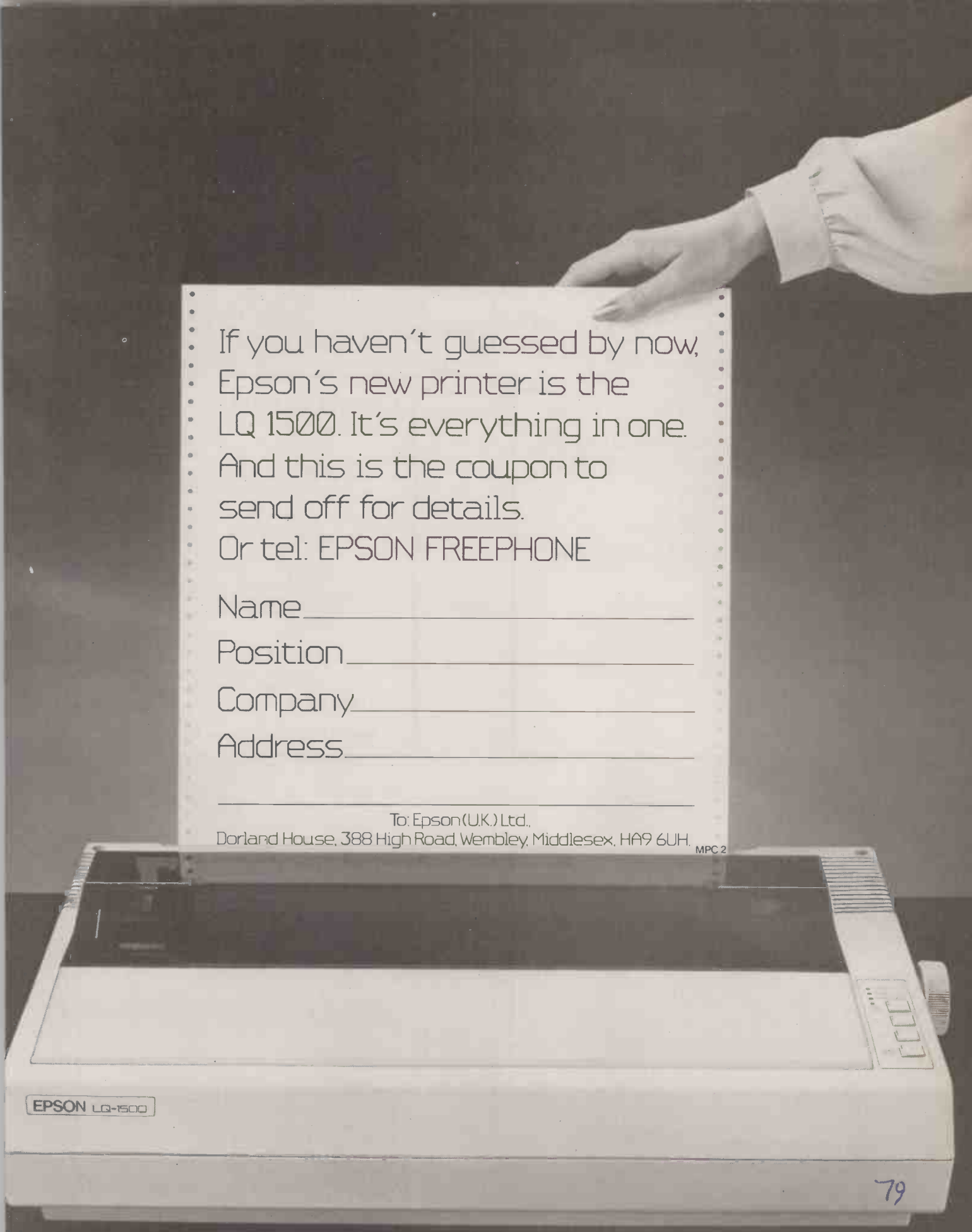

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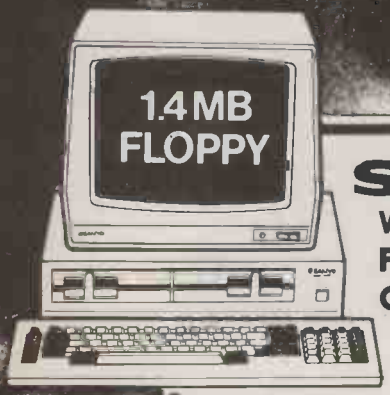

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REVIEW

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AMSTRAD PCW-8256

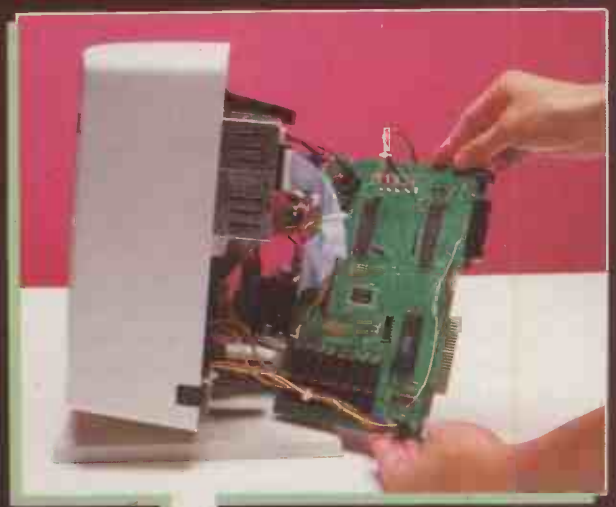
CHEAP BUT NOT NASTY

By Glyn Moody

MALLARD BASIC

The Mallard Basic supplied with the 8256 was written by the same company that wrote Locomotive Basic for the Amstrad CPC-464. In fact Mallard Basic was devised first as an enhanced Basic for use with the BBC Z-80 second processor. For the CPC-464 home computer, commands to handle sound, colour and graphics were added. In Mallard Basic, the original product was developed further, but without the additional irrelevant commands. It is possible to run programs for the 464 on the 8256 provided these commands are not used.

As well as all the normal commands, Mallard Basic has arrays and a Def FN which allows home-grown functions. There are also a range of CP/M commands which can be called up from Basic, including Dir, Era, Ren and Type. Perhaps the most interesting aspect of the product is something called Jetsam. This allows keyed random access, a feature which is rare in micro Basics. Essentially it provides a crude kind of database structure with provision for up to eight keys, which are rather like fields in a database, and which are used to index files. It is possible to carry out searches on one or more of these keys. Eventually multi-user versions will be supported with file and record-locking. Jetsam is a significant addition to the other Basic facilities, and one which makes the language both more powerful and also intrinsically well suited to serious applications. The manual which accompanies Mallard Basic is excellent.



The Amstrad PCW-8256 has no separate systems box. The motherboard consists of a single, sparsely populated PCB contained within the VDU unit.

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Availability: now

With its Epson-style ribbon cartridge, the printer is professional both in looks and performance.

Our previous review of an Amstrad machine in October 1984 turned into rather a rave, and this is going to be no different. The name is the worst thing about Amstrad's Personal Computer Word Processor 8256: in practically every other respect, it is the best-value machine I have ever come across.

Consider the facts. You get a Z-80A, 256K RAM, 180K 3in. disc drive, 12in. green monitor, keyboard, dot-matrix printer, CP/M Plus, Mallard Basic and DR Logo, together with a powerful word processor; the cost is £399 plus VAT.

One of the joys of the system is the simplicity of setting it up. Only one mains plug and lead is required, and then all you have to do is connect the keyboard and printer to the main unit, which houses the VDU and disc drive.

The keyboard is slightly raked and embarrassingly full of keys. In addition to standard QWERTY, there are a number of keys dedicated to word-processing functions. Partly as a result of this, the distance to the right-hand Shift key and the Backspace Delete is slightly longer than usual: touch typists with small hands may well find it a strain. This seems to be one of the few places where Amstrad has put a foot wrong. The keyboard is slightly clattery, but has a good feel and is more than adequate for serious word processing.

The printer is built around a mechanism from Seikosha, and has an Epson-like ribbon mechanism. When operating under CP/M, it works with standard Epson codes. Amstrad says that it offers speeds of up to 90cps in draft mode and 20cps in NLQ. Effective matrix sizes are 9 by 12 in draft mode and 19 by 24 in NLQ. The printer can handle continuous stationery or single sheets, and offers a very wide range of type styles. For single sheets there is a neat feed and alignment device. All the electronics for printer are on the main motherboard inside the main unit.

The bulk of this unit is taken up by the 12in. green phosphor monitor. It has a large 90-character by 32-line display, with a resolution of eight by eight for each character. The green is slightly garish, even with the brightness control at minimum. The overall effect is not unlike that of an Apricot or even an IBM PC display.

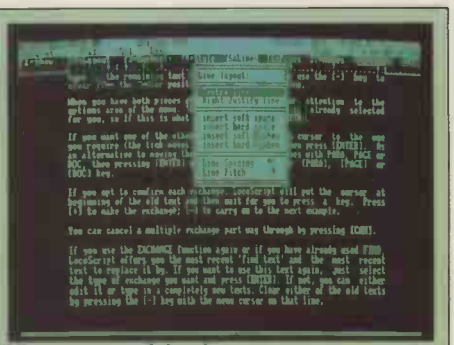
However, the character set is such that ascenders and descenders sometimes touch, which reduces legibility. As you move your eyes across the screen there is a very slight wavering of the image; otherwise it appears very steady, and scrolling is smooth. Unfortunately, there is no tilt or swivel on the unit. There is also no physical Reset button; instead the machine is reset by holding down the Shift, Extra and Exit keys simultaneously.

To the right of the screen is a 3in. disc drive using double-sided discs which have to be flipped over manually. The formatted capacity is 180K each side. It is regrettable, though perfectly understandable, that Amstrad went for this size rather than the industry standard 3.5in. Clearly, Amstrad was offered a deal it could not refuse for using what are increasingly becoming the pariahs of the storage world.

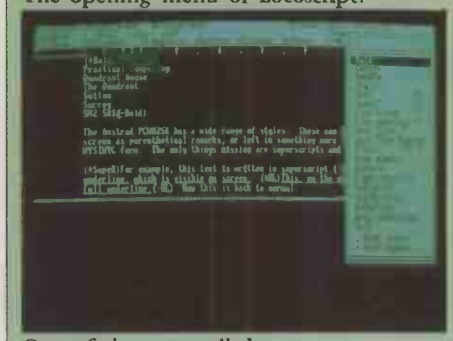
It is a sad fact that apart from people like Tatung, practically no one is using this size. However, if the Amstrad 8256 takes off in the way it is likely to, it could keep the demand above the critical point where it is viable to produce them. There still remains the problem of lack of third-party software, though for a semi-dedicated machine like the 8256 this is not so pressing. Amstrad has also indicated that a number of leading CP/M products like Supercalc II and possibly dBase II and Ashton-Tate's Friday will be coming through shortly.

To get inside the machine you simply

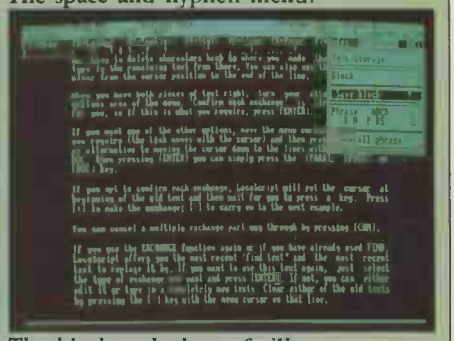
The opening menu of Locoscript.



The space and hyphen menu.



One of the two pull-down menus.



The block and phrase facility.

(continued on page 85)

	SAGE ACCOUNTANT	APRICOT ACCOUNTANT	PEGASUS
SALES, PURCHASE, NOMINAL LEDGERS	✓	✓	✓
TRIAL BALANCE, PROFIT & LOSS, BALANCE SHEET	✓	✓	✓
FULL AUDIT TRAIL	✓	✓	✓
REPORT GENERATOR/ DATA ANALYSIS	✓	✓	✓
DEPARTMENTAL/SALES/ PURCHASE ANALYSIS	✓	✓	✓
AGED DEBTORS/ CREDITORS ANALYSIS	✓	✓	✓
STATEMENTS & DEBT CHASING LETTERS	✓	✓	✓
AUTOMATIC & MANUAL PAYMENTS ALLOCATION	✓	✓	✓
PRINT SPOOLING	✓	✓	✓
UPGRADEABILITY	✓	✓	
COLOUR DISPLAYS FOR EASE OF USE	✓	✓	✓
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AS YOU CAN SEE IT ALL COMES DOWN TO THE BOTTOM LINE

Some naive individuals still believe that a higher price automatically guarantees higher performance. These misguided souls are happily shelling out for accounting programs that give them little or no change from £1,000, when Sage Accountant would leave them change from £500. Their mistaken belief is that, at that price, Sage can't possibly be as good.

Actually, Sage isn't that good. It's better. Out of the 19 important functions listed above, Apricot provides a mere 12, while Pegasus does only slightly better with 13. Sage Accountant has got the lot. For roughly half the price.

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*Comparisons relate to versions for Apricot PC, IBM PC and compatibles. Sage programs are available for a wide range of MS-DOS.

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BETTER SAGE THAN SORRY

PC11/85

(contined from page 83)

release a few screws. What is revealed is an almost anorexic interior. Apart from the power-supply unit, there is only one board — and even that looks half empty. In fact there are only about 18 chips altogether, including eight 256Kbit RAM chips. Next to the RAM there is space for another 256K.

The board has been simplified to this extent by using three main chips apart from the Z-80A. One handles the disc, another the printer, and a third custom chip from NEC everything else. One benefit of this approach is the high degree of reliability it should entail.

The 8256 has no separate ROM chips, and so all software is loaded from disc. The machine is designed principally as a semi-dedicated word processor, and comes with Locoscript software bundled in. This has been written by the same company which has produced the Mallard Basic — see the box on page 82 for details. Many of the team who produced it had previously worked on a high-quality and high-price dedicated word-processing system called Diamond. Locoscript shows its heritage in its comprehensive facilities and the wide use of dedicated keys.

PARTITION CLASSES

The basic approach is to use menus along the top of the screen with further pull-down options. The opening screen handles all disc operations. In addition to disc A and an optional second disc, use is also made of the generous quantity of RAM to set up a RAM disc, called M. Typically this has a capacity of about 100K. Each drive can be divided into a maximum of eight partitions, shown on the screen as separate columns of files. Partition classes are shown above the columns. Files can be transferred between the various partition classes on all of the discs from the main menu of commands, called up using the functions keys which lie alongside the numeric keypad. Deleted files, also handled from here, remain as so-called limbo files which can be recovered until the space is needed for fresh files.

From this menu you can also print out files. To do this, you simply position the cursor over the relevant file and press P. There is also the option of direct printing, using the 8256 like a standard electronic typewriter. After text has been entered, pressing Return sends it straight to the printer. This facility is useful for filling in forms and such like.

Creating a file is a special case of editing, since each partition contains a template which is loaded when you create a file within that particular class. For example, you could set up a letters partition which automatically enters your address in the top right-hand corner on every document. To edit a named file, you simply place the cursor over the name and press E. To confirm, you then press the Enter key, positioned in the bottom right-hand corner. This key is used throughout the word processor to enter commands, and is quite distinct from Return, which inserts Carriage Returns only.

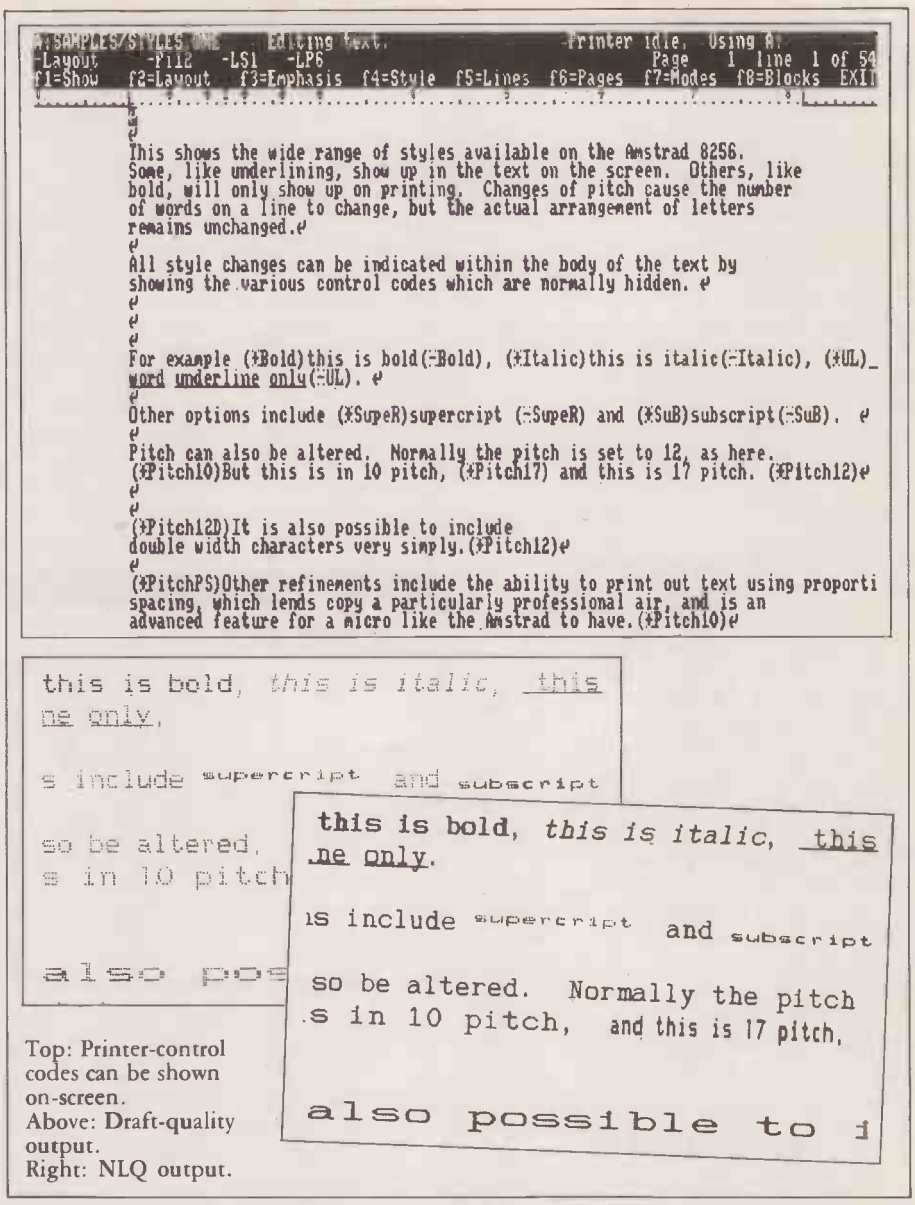
The editing screen also has a small menu of commands labelled by function keys along the top as with the disc-management menu. In addition to the file name and printer condition, a status line indicates the settings for line spacing and line pitch, and there is also an indication of page and line number.

Cursor movement is effected via a huge battery of keys and commands. You can use the cursor keys alone, or in combination with the Shift key if you need to move more quickly. Some of the numeric keys are configured to move to the end of the line, end of the page or to the next paragraph. Using Shift with them gives further variations, and using any of them with the Alt key reverses the direction in which they act. Also on the keypad is a Find and Exchange facility.

Similarly, copy and paste keys allow you to excise sections and move them around. A particular powerful feature in this context is Locoscript's handling of blocks and phrases. When you cut or copy, you can save the text to one of 10 blocks or 26 phrases, depending on the length. These can be kept and used throughout the document. They can also be saved permanently to disc.

As characters are entered in the body of existing text, the line splits to make room. After you have inserted or deleted text, it is

(continued on next page)



Top: Printer-control codes can be shown on-screen.
Above: Draft-quality output.
Right: NLQ output.

BASIC BENCHMARKS

Running the standard Benchmarks gave figures very close to those of the Amstrad CPC-464. This places the 8256 well up the league table, and ahead of both the BBC B and the IBM PC.

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Amstrad PCW-8256 — Z-80A	1.0	3.4	9.5	9.7	10.2	18.9	29.9	33.5	14.5
Amstrad CPC-464 — Z-80A	1.2	3.4	9.3	9.7	10.3	19.2	30.4	34.3	14.7
BBC B — 6502	1.0	3.1	8.3	8.7	9.2	13.9	21.9	52.0	14.8
IBM PC — 8088	1.2	4.8	11.7	12.2	13.4	23.3	37.4	30.0	16.8

(continued from previous page)

necessary to press Relay for a reformatting to take place. This normally ripples through to the end of the paragraph affected.

To save a file you press Exit. A menu drops down offering options to Save and Continue, Save and Print or just Exit. Saving to disc is reasonably fast; the main problem is in returning to editing. After saving, the cursor is placed at the head of the text, and you then have to scroll through the file to reach the end. There does not seem to be a Jump option to take you straight there.

The menu called down by pressing f1 gives you control over aspects of on-screen appearance. For example, you can turn on or off on-screen signalling of Carriage Returns and tabs, and blanks and spaces can be indicated throughout a document. All such features are turned on or off using yet more specialised keys, marked + and −, and situated to the left and right of the space bar. To enter a command you press Enter; to cancel a menu you use the Can key.

The f2 key lets you set up and use various layouts, such as a document's tab settings, decimal tab settings, paragraph indents and margins. Several different layouts can be used within the same document.

From the f1 menu you can also hide or show the various control codes used to mark changes to boldface, superscript and so on. The commands for this are handled from the f3 and f4 pull-down menus. As well as standard options like italic, full underline and word underline, of particular note is the range of pitches available — from 10 to 17 — as well as proportional spacing. Coupled with the NLQ printing, this last feature makes for extremely professional-looking output.

SOFT HYPHENS

Other standard features include centring and right justification of text. There is a range of provision of hard spaces — that is, those which cannot be split — and soft hyphens which can. These are controlled from f5, along with line spacing and line pitch. Altering the line spacing does not produce any change on-screen, only at printout. Similarly, from f6 you can bind together groups of lines to ensure that they are not split at the end of a page. Generally, Locoscript is very intelligent about the handling of page breaks.

The f7 key deals with various peripheral tasks. For example, you can enter the disc-management menu, and print out other files while you are editing. You can also insert entire files in the body of your present text, which is very useful. A small text can be set up as an *aide-mémoire*, identifying the contents of the whole file. This can be read from the disc-management menu, and saves loading an entire file.

From here you also handle headers and footers, though this seems to entail scrolling through a document back to the beginning, which is time-consuming. As befits a word processor of some sophistication, the facilities are quite extensive. For example, you can set up different headers and footers on odd and even pages, and for the first and last pages of the document. Unfortunately, the price you pay for this is a slightly obscure structure which involves much to-ing and fro-ing. Despite prolonged efforts I was unable to set up automatic pagination.

As an alternative to using the function keys' pull-down menus, most commands can be accessed using the + and − keys. Pressing + brings down a condensed menu. Options are selected from it using one- or two-letter codes. Similarly, the − key is used to terminate some commands. There is a slight delay after pressing the + or − key, and if you enter the codes immediately, you can bypass even these compressed menus.

Yet another dedicated key, marked Ptr, calls up the special printer commands, also displayed along the top of the screen. The most important of these shows the current defaults for single-sheet or continuous stationery, and draft or NLQ mode. In draft mode, printing is bi-directional; NLQ requires two sweeps in the same direction. The NLQ in particular is of very high quality, quite good enough for business correspondence.

PCW-8256

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	☐	■
Ease of use	☐	☐	■	☐
Documentation	☐	☐	☐	■
Value for money	☐	☐	☐	■

☐Unbeatable value as a word processor. It remains to be seen how useful it will be as a straight CP/M machine.

All in all, Locoscript is a very powerful professional word processor. There is little that cannot be accomplished on it, but this versatility is achieved at the cost of sometimes rather complicated command structures. However, those who are content to use its main facilities will find it straightforward enough. If it has any faults, it is in the way that you are occasionally obliged to scroll through a long document, which can be slow.

Locoscript is accompanied by an impressively thick spiral-bound book, which also contains details of CP/M Plus. The documentation is excellent: clearly written, jargon-free and well illustrated. It also appears complete, which is rare enough for a new machine.

As far as CP/M Plus is concerned, the implementation is fairly standard. There is a transient program area of 61K, and a RAM disc of 112K. Programs written to run under CP/M Plus on the Amstrad CPC-6128 should work provided there are no calls to firmware. Of note is the Paper command which allows different paper sizes to be handled. Pressing the Ptr key adds a printer command line along the bottom of the screen, from which draft or NLQ can be set along with other parameters. As with Locoscript, pressing Extra and Prt produces a handy screen dump. As well as standard utilities, the GSX graphics extensions are also provided.

Together with Mallard Basic, the 8256 comes bundled with DR Logo. Since the 8256 is best suited to serious rather than educational use, this seems to have more to do with the economics of bundling than any kind of grand strategy.

THINKING BIG

Amstrad has said that it hopes to ramp up production to 40,000 units per month by the end of the year, so clearly it is thinking big. Already it has announced that in addition to the second 1Mbyte disc drive, which will be internal and fitted by the dealer as part of the £159 plus VAT cost, there is a serial interface coming for £65 plus VAT. These products are likely to further enhance the appeal for serious users.

Already, the Amstrad 8256 looks a very strong contender for the office. As a stand-alone word processor, it is powerful enough to handle all day-to-day taks, yet so cheap as to undercut dedicated machines by a huge factor. Similarly, because of its price, it will be worth investing in one for any manager wishing to use it for occasional word processing, spreadsheets and possibly electronic mail, or just to learn about micros: even a simple computer course would probably cost more.

Finally, it offers a very competitive package for DP departments wishing to provide intelligent terminals with printers, hooked up to the company mini or mainframe. Already HM Systems has produced a networked system including the 8256 and the Minstrel computer, running under Turbodos, called the Amstrel. It seems the Amstrad Personal Computer Word Processor is all things to all people.

CONCLUSIONS

■The Amstrad 8256 is a complete, usable word-processing system for £399 plus VAT. This includes a dot-matrix printer with speeds of 90cps draft quality and 20cps NLQ.

■The Locoscript word processor is very powerful, and lets you do practically everything you want. The price you pay for this is a somewhat complex command structure.

■Bundled with the 8256 is CP/M Plus, Mallard Basic and DR Logo, which is a generous allowance by any standards. The provision of keyed random access within the Basic is a considerable achievement.

■The general production quality of the hardware, software and manuals is very high. Particularly impressive is the low chip count.

■Those with small hands may find the design of the keyboard frustrating.

■The VDU's phosphor is a particularly garish green which some may find unacceptable.

■There is currently little software for the 8256 apart from the bundled packages. However, its use of CP/M Plus holds out the hope that packages available under that operating system may trickle through.

■Expansion is limited to an additional disc drive, more RAM and one external edge connector.. PC

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Personal Computer World, October 1985

'The Amstrad PCW8256 . . . must represent a "best buy" for anyone who wants to do word processing and run a computer at home. It is also suitable for business use for people – from clerks to managing directors. The low cost – £399 ex VAT – makes it competitive with electronic typewriters, and the extra facilities of the micro are thrown in virtually for free.'

From The Guardian, 5th September 1985

'a very good word processor'

Personal Computer World, October 1985

Included in this Amstrad package is a very powerful dedicated Word Processor suitable for the first time user. Features include pagination, automatic paragraph alignment, plus many editing facilities.

AMSTRAD PCW 8256 FEATURE CHECK

- **256k RAM** Big memory to handle today's software.
- **BUILT-IN 3" DISK DRIVE** Fast loading and storing with 180k formatted capacity per side of disk.
- **82-KEY KEYBOARD** 8 function keys, numeric keypad plus dedicated word processor keys including Cancel, Cut, Copy and Paste.
- **GREEN SCREEN MONITOR** Massive 90 columns by 32 lines. Can display 50% more on-screen data than a normal 80×24 monitor.
- **DUAL MODE PRINTER** Providing Near Letter Quality text at 20 characters per second, Draft Quality text at 90 cps. Automatic paper feed system.
- **SOFTWARE** LocoScript Word Processor. CP/M Plus Operating System, giving access to thousands of commercial software programs. Plus DR Logo, Mallard Basic.

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PHILIPS YES
A MIXED BAG

By Jack Schofield

This 80186-based machine offers the speed of an AT at the price of a PC.

Philips' oddly named new micro — the company christened it ":Yes", colon and all — packs an 8MHz Intel 80186-based system into a small, neat box. This gives it the speed of an 80286-based IBM PC/AT, but at less than half the price.

The price/performance ratio is attractive, but not unique. In March this year we reviewed a British micro that does the same trick: the Research Machines Nimbus. Indeed, the machines have many similar features: the 80186 chip, 3.5in. disc drives, ROM cartridge slot, etc. They even look the same.

MULTI-NATIONAL

The major difference is that the RM Nimbus is made by a small British company that specialises in niche markets such as education and networking. The Yes is made by a multi-national with the power to put a huge volume of machines on the international market. The preview sample was transported from Vienna, where it was designed and built by Philips Austria.

The Yes comes in two parts, a system box and a detached keyboard. To that you have to add a monitor; Philips supplies suitable models. The system box features one or two Teac 720K 3.5in. disc drives on the right, and a ROM cartridge slot on the left, along with a power-on LED and a Reset button. The detached keyboard, which plugs in underneath the machine, can be slid under the system box when not in use.

On the back of the main unit there are power in and out sockets, an on/off switch and a number of ports. The standard ones are monochrome composite video and audio sockets, an RS-232 port terminating in a DIN plug, and two edge connectors from the motherboard. These provide interfaces for a parallel printer and an external floppy-disc drive. Further ports can be added on a modular basis.

A panel on the left-hand side of the machine lifts off to allow up to two expansion boards to be slotted inside, under the motherboard. The expansion card supplied with the review machine carried 512K of RAM, a SASI-type hard-disc interface, a mouse port, and a clock/calendar with battery backup. The extra ports are accessed by lifting panels on the back of the system box. The SPI program Open Access is also bundled with this board but was not supplied for review.

Upgrading the basic 128K machine to a total of 640K in this way took about 10 seconds. There were no screws to undo, no DIP switches to set, and it was not even necessary to move the monitor for access.

Another panel on the left of the machine turned out not to be a panel at all, but a removable plastic box containing the monitor connection. A number of options are available to cope with the video-display systems used in the wide range of countries Philips sells to. The one tested was an RGB module with a DIN plug and an IBM-style nine-pin D-connector.

All the pin-out identification was very neatly moulded into the plastic surround — a simple idea which could save hours of hunting through impenetrable documentation or even circuit diagrams. The facility to drive a standard television set is a useful one, both for home users and for executives who want to use the light and portable system box at home.

Overall, the modular design of the Yes will be an advantage to users and dealers, who will be able to configure machines as they want them without taking the lid off the box. This is just as well considering the vast number of screws used to bolt it all together. It will also be to Philips's advantage, in helping the company to compete in an international marketplace.

KEYBOARD

When it came to the practical computing, the Yes was something of a mixed bag. The continental-style flat-topped keyboard turned out to be awful, but Philips assures us this version will not be supplied in the U.K. A more conventional model with sculptured key tops will be provided.

The keyboard layout was confusing, and several of the keys were not implemented. For example, there are two orange function keys — not alphanumeric keys — one of which carries !, and the other a crossed-out !. Also the keyboard did not follow the IBM PC layout. This may lead to confusion when different software houses transfer IBM programs to the Yes and implement the keys differently.

A Philips Monitor 80 was used for this review, and its green screen produced a sharp, stable image suitable for spreadsheet work and word processing. However, flipping the DIP switch inside the video module, unplugging a Tandy colour monitor from our IBM PC/XT and plugging it into the Philips, produced only a scramble of black and red lines, with no text in sight.

One particularly nice feature of the Yes with the green screen is the speed at which the video display is written. When

SPECIFICATION

CPU: Intel 80186 running at 8MHz
RAM: 128K standard, 640K enhanced
ROM: 64K announced — not supplied in the review sample; cartridge slot for 32K, 64K or 128K module
Storage: one or two 720K 3.5in. discs
Keyboard: detached keyboard; U.K. version to be announced
Display modes: 80 characters by 25 lines in text mode; graphics from 640 by 250 pixels in four colours to 160 by 250 in 16 colours
Ports: serial port, video and audio sockets, floppy-disc and parallel printer connectors; ROM cartridge slot
Video interface options: UHF modulator, Scart connector, RGB TTL monitor module
Software in price: DOS Plus, Basic 86, tutorial and utilities
Expansion card: 128K or 512K of RAM, mouse port, hard-disc interface, clock/calendar plus Open Access software
Dimensions: 470mm. (18.5in.) x 372mm. (14.6in.) x 125mm. (4.9in.)
Weight: 6.6kg. (14.5lb.) including keyboard
Prices: 128K entry-level system with one disc drive, £995; 256K enhanced sysem with two drives, extra ports and Open Access, £1,595; 640K enhanced system, £1,795; prices do not include a monitor or VAT
Manufacturer: Philips Austria, Personal Computer Division, Breitenseer Str 116, A-1141, Vienna
U.K. distributor: Systemstate, 01-391 5533; Kingsway Data, (09328) 68911
Available: November

BENCHMARKS

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Philips Yes — 80186	0.5	2.0	4.3	4.4	5.0	9.4	14.6	13.8	6.8
Compaq 286 Deskpro — 80286	0.3	1.2	2.8	2.9	3.2	5.7	9.1	9.2	4.3
RM Nimbus — 80186	0.5	1.8	3.9	4.0	4.6	8.5	13.2	13.0	6.2
IBM PC/AT — 80286	0.5	1.9	4.6	4.7	5.2	9.1	14.6	13.5	6.8
Olivetti M-24 — 8086	0.5	2.0	4.6	4.7	5.2	9.4	14.8	16.1	7.2

The standard Basic benchmark routines — see *Practical Computing* January 1984, page 104 — were run on the Yes and comparable machines. All timings are in seconds.

The design is efficient as well as stylish. Expansion cards can be fitted in seconds (below) and changing the output module is just as easy.

programming in Basic, that and the 80186 processor gave a sparkling performance. The Basic Benchmarks were run on Basic 86 under both MS-DOS and DOS Plus — see box — and produced the same average result as an IBM PC/AT, 6.8 seconds. Unfortunately, this performance was not carried through to the version of WordStar supplied, which ran at normal speed. I was unable to improve it by reinstalling WordStar or reconfiguring the operating system. The Yes would only deliver 8088-type PC performance, not an AT-like one.

A factor in the slowish speed of WordStar was the slowness of the Teac 3.5in. discs. Again, messing around with the operating system and buffers brought no improvement. Not being able to load a 5.25in. disc containing our Bagshaw Disc Benchmarks into the Yes, the slowness remains only on impression. However, I hope this will be a factor of the early machines only and that — as happened with the Apricot — disc performance will improve.

The Yes supplied for review had two operating systems, Microsoft's MS-DOS 2.11 and Digital Research's DOS Plus, with Philips claiming a certain amount of compatibility with both the IBM PC and the Apricot. MS-DOS is a known quantity, and performed to the usual high standard. DOS Plus is a development of CP/M and Concurrent DOS; it is claimed to run MS-DOS programs, and to perform a certain amount of concurrent processing. It can hold up to four programs at once as virtual terminals, assuming there is enough memory available.

CONCURRENCY

DOS Plus offers a hierarchical file structure to match MS-DOS 2, batch files, and an optional menu-driven front end taken straight from Concurrent DOS. It does useful things like label the function keys and can run a digital clock in the bottom right-hand corner of the screen.

After a tedious Ctrl-C back at the A> prompt, DOS Plus was able to load and run Basic 86 and WordStar from an MS-DOS disc. A copy of Logistix also ran under both operating systems. Lacking more 3.5in. software, I was not able to test this further. Also, I could find no way to use the concurrency feature, which I assume was not implemented. This, together with DOS Plus's tendency to throw up strange characters from the outer reaches of ASCII suggests further work is needed on it.

Yes discs are said to be file compatible with Apricot ones. However, I was unable to load a WordStar file created on an Apricot XI using either operating system on the Yes, though it would read the disc directory.

Philips plans to supply DOS Plus on a 64K ROM as the standard operating system for the Yes. At the time of writing, I would take MS-DOS instead.

With both operating systems, Philips claims IBM PC compatibility to the BIOS level. That is to say, any IBM PC programs that are well behaved and make their system calls in an authorised manner should run on the Yes once transferred to a 3.5in disc. However, the real standard is the IBM PC hardware, and any software that makes direct calls to this, such as the Microsoft Flight Simulator, clearly will not run.

SOFTWARE REQUIRED

Software houses will somehow have to be persuaded to port IBM PC software across, either by Philips or by large sales of the Yes. So far Open Access runs fine, and indeed this package is bundled with the upgrade card and the more expensive Yes system. Microsoft's GWBasic, Digital's DR Logo and Gem are due from Philips, and Logistix also runs. Lotus 1-2-3 and Ashton-Tate's dBase III are said to be on the way. Clearly the system is not as good a bet as a straightforward IBM compatible from the software point of view, but it shows promise.

Philips is only just launching the Yes and some things, such as the manuals, were not available for this preview, or not supplied, like Open Access. When the machine is shipped the documentation should include *Getting Started*, a User Guide, and a DOS Plus manual. DOS Plus will be implemented in ROM; unfortunately, it will not include the virtual-consoles feature. MS-DOS and a full Concurrent DOS should follow in 1986.

Add-on boards scheduled for release include a network board, which uses Cheapernet with DR net software, an IEEE-488 board, and a wire-wrap board if you want to add your own enhancements.

CONCLUSIONS

- The Philips Yes is a powerful micro which is attractive for its modular design approach and low price.
- Early samples of the software show some rough edges, and need more work if the real performance of the machine is to live up to its specification.
- The inability to read standard IBM PC 5.25in. discs is a major drawback from the software point of view. However, the situation could change if or when IBM finally moves to 3.5in discs.
- Philips believes the Yes will appeal to a wide market, ranging from the home hobbyist through education to full business use. There is such a market, but Philips will have a tough time getting its share, with competition like Apricot, Research Machines and the forthcoming Commodore Amiga. PC

REVIEW

KAYPRO 2000
COMPATIBILITY PLUS STYLE

By Jack Schofield

IBM PC compatibility now comes in an elegant, well-built lap-portable package.

SPECIFICATION

CPU Intel 8088 running at 4.77MHz; socket for 8087
RAM 256K, upgradable to 768K
Keyboard 79-key detached with cursor block and 10 function keys
Display liquid crystal display of 80 chracters by 25 lines, 640 by 200 pixels
Drives 720K 3.5in. disc drive; optional 5.25in. and hard discs
Ports RS-232C; expansion bus
Extras carrying bag and battery charger supplied
Size 66mm. (12.6in.) × 290mm. (11.5in.) × 330mm. (13in.)
Weight 5kg. (11lb.)
Software supplied MS-DOS, GWBasic, WordStar, Mailmerge, Infostar, Calcstar, Mite, Polywindows, Travelling Expense Manager
Price £1,711 plus VAT
Supplier Kaypro, U.K. Ltd, PO Box 59, Ilford, Essex IG4 5NG. Telephone: (06286) 67547
Availability now

Kaypro has become successful through offering good-value transportables with bundled software, but its machines have always been utilitarian in design. With the Kaypro 2000 IBM-alike, however, the company has produced something different. It's small, it's neat, and it has style.

The Kaypro 2000 is a briefcase-type portable micro with an Intel 8088 processor, 256K of RAM, 80-character by 25-line screen, built-in 3.5in. 720K disc drive and detached keyboard. The price also includes a large bundle of software, a zip-up case and a battery charger. The 2000 runs for about four hours from its built-in lead-acid batteries — the time depends mainly on the amount of disc use — or can be used direct from the mains.

Like previous Kaypro computers the 2000 is solidly made out of sheet metal. That, and the batteries, mean it is not spectacularly light at about 5kg. However, the system box is small, flat and neat. It is quite easy to carry, either in its shoulder bag or with the carrying handle. In other words, this is a true portable, like the Datavue 25 and Data General One, not a transportable.

The case is made up of two metal pressings, with a thick, ridged rubber moulding around the join. This moulding conceals a number of features, such as the RS-232 port under a fold-out flap, the pull-out carrying handle, and the catches to release the lid. On the bottom of the case are two sockets for American phone jacks, and a 100-pin expansion bus hidden under a plastic panel.

Lifting the Kaypro's lid reveals the LCD screen, disc drive and keyboard. The disc is on the right-hand side. The case pops up at an angle for discs to be inserted. On the left-hand side there is a hinged cover with space to pack two 3.5in. discs. The keyboard occupies the rest of the bottom of the case. Being attached to the system only by a coiled cable, it can be slid forward, or lifted out altogether if desired.

This might seem a bit of a gimmick. However, with many lap-tops it's a problem getting both good screen illumination — which is essential for LCDs — and a comfortable typing position. Having a detached keyboard helps.

The 77-key keyboard does not follow the IBM PC layout. The function keys have been repositioned across the top. Cursor control is by four separate dedicated keys, while the numeric pad shares keys with the letters U, I, O, J, K, L and M. However, the four cursor keys still provide numbers too. An extra Shift key, labelled with a blue box, has to be used with the cursor keys for access to the Pg Up, Pg Dn, Home and End functions. We could not discover whether any of this affects IBM compatability as — in the absence of a 5.25in. add-on drive — only the software supplied by Kaypro on 3.5in. discs could be used with the machine.

ALL YOU NEED

The software supplied includes the familiar Micropro bundle of WordStar with Mailmerge, Infostar and Calcstar, Microsoft's MS-DOS 2.11 and GWBasic. Extras are the communications package Mite, Polywindows/Kdesk and Travelling Expense Manager.

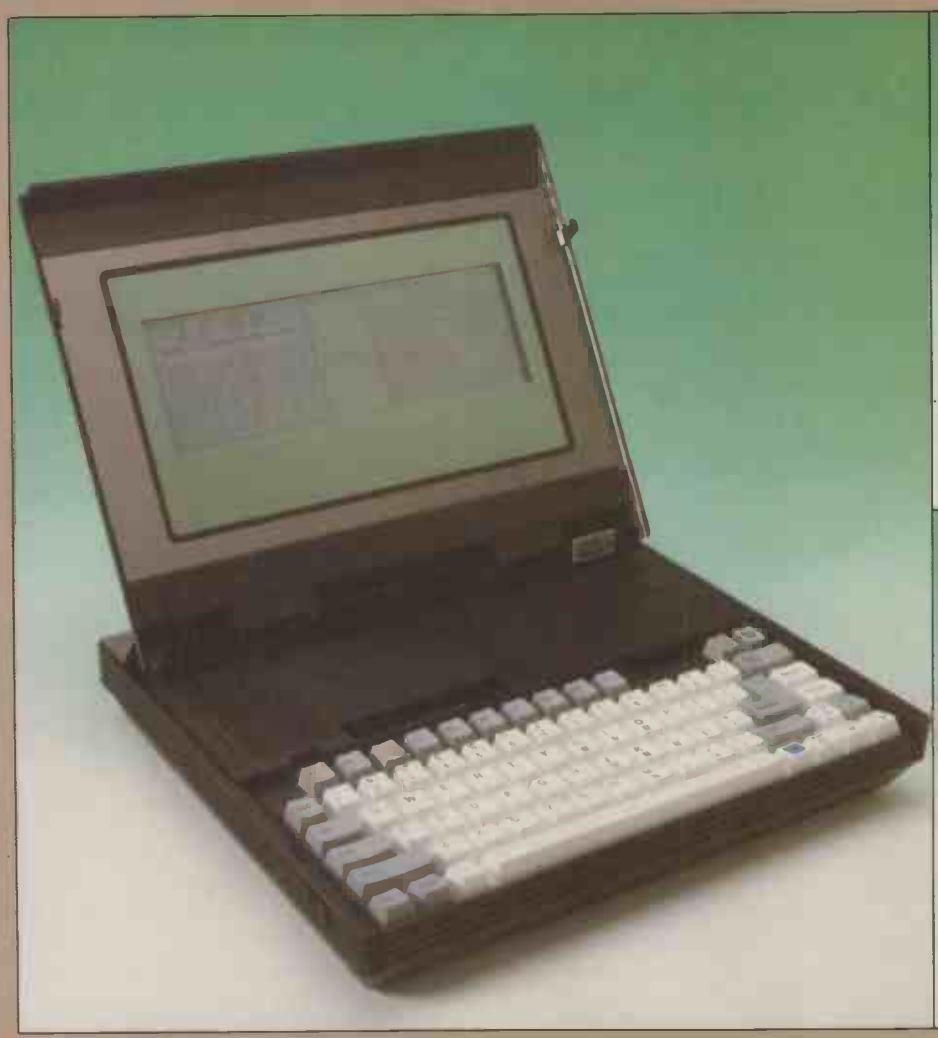
Polywindows, a so-called desk-top emulator, provides a calculator, memo pad, index-card file, phone directory, calendar, Grabber, Polykey and a puzzle. It consumes 90K of RAM. Kdesk is a cut-down version of Polywindows with fewer utilities.

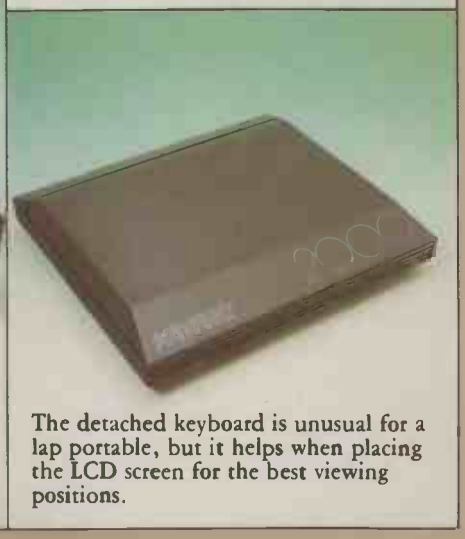
You switch on the Kaypro 2000 by opening the lid. It counts its RAM, looks for a disc to boot, then drops you into the familiar PC-DOS/MS-DOS environment. The ROM BIOS, from Phoenix Software, is known to provide a high level of IBM compatibility. The system is booted from an MS-DOS disc. Kaypro provides some good

BENCHMARKS

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Kaypro 2000 — 8088	1.0	4.2	9.3	9.7	10.6	19.4	30.2	30.7	14.4
Olivetti M-24 — 8086	0.5	2.0	4.6	4.7	5.2	9.4	14.8	16.1	7.2
ACT Apricot — 8086	1.5	4.8	10.4	10.8	12.2	22.8	35.5	34.0	16.5
IBM PC — 8088	1.2	4.8	11.7	12.2	13.4	23.3	37.4	30.0	16.8

The standard Basic Benchmarks — see *Practical Computing*, January 1984 page 104 — were run on the Kaypro 2000. All times are in seconds.





The detached keyboard is unusual for a lap portable, but it helps when placing the LCD screen for the best viewing positions.

KAYPRO 2000

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	☐	■	☐
Documentation	☐	☐	■	☐
Value for money	☐	☐	■	☐

☐ If you want an IBM-alike portable and accept 3.5in. discs, the Kaypro's solidity, style and bundled software make it an attractive option.

copying and setup routines, and most users should be able to adapt one of the batch files to load, say, Polywindows on start-up.

On test, the disc drive made an odd vibrating/chiming sound when first reading a disc. Raising the cover to insert a disc also revealed a regrettable shortage of shrouding to keep out dust. The screen proved fairly difficult to read, even after the contrast had been increased by pressing Ctrl-Alt-f2. Partly this was the usual limitation of all 80-character LCD screens, but it was also caused by the hinged lid being too vertical. An extra couple of notches to let you tilt the screen further back would increase readability. However, the removable keyboard helps here. The 79-key keyboard is of the full-travel type, and quite usable for word processing.

All the bundled software performed correctly from the three discs supplied. WordStar and its chums are well-known packages, and if you like them, you get value for money from what is essentially free software.

Travelling Expense Manager, from Travelling Software Inc., is a disc-orientated menu-driven package operated via the function keys. It works using a category code, an account code and a fund such as cash, cheque or choice of a range of credit cards, thus providing for full accountability and a wide range of reports.

POLYWINDOWS

Polywindows, from Polytron Corp., is a RAM-resident program much like Borland's Sidekick, but more powerful. It uses a pull-down menu system, has overlapping windows, and does lots of neat things. For example, when you use the file of index cards, it shows you the top of the next card behind it. There's an extra calculator for hex, octal, binary and decimal, as well as the regular type. Polykey provides a macro facility. Grabber enables you to grab things from one document and move them to another.

You also have access to seven DOS functions from Polywindows, for file and directory handling. And if you're wondering, the puzzle is one of those four-by-four rectangles with numbers from 1 to 15 mixed up; you have to put them in order. Not only is Polywindows/Kdesk useful, it is impressively fast. Most operations seem instantaneous.

The Kaypro 2000 performed up to the standard of a typical 8088-based IBM look-alike. This is average, rather than spectacular, by today's desk-top standards. If it seems unfair to judge a portable by these, bear in mind that the price precludes most people from buying it as a second machine.

Unfortunately, as with the Data General One, the screen is just not legible enough for it to serve as a desk-top computer. Kaypro plans to solve this problem by offering an expansion box which will sit underneath the 2000 to provide expansion slots and other facilities. It should also be possible to add a full monitor. The 2000 would then, with its detached keyboard, be usable both as a desk-top and a portable micro.

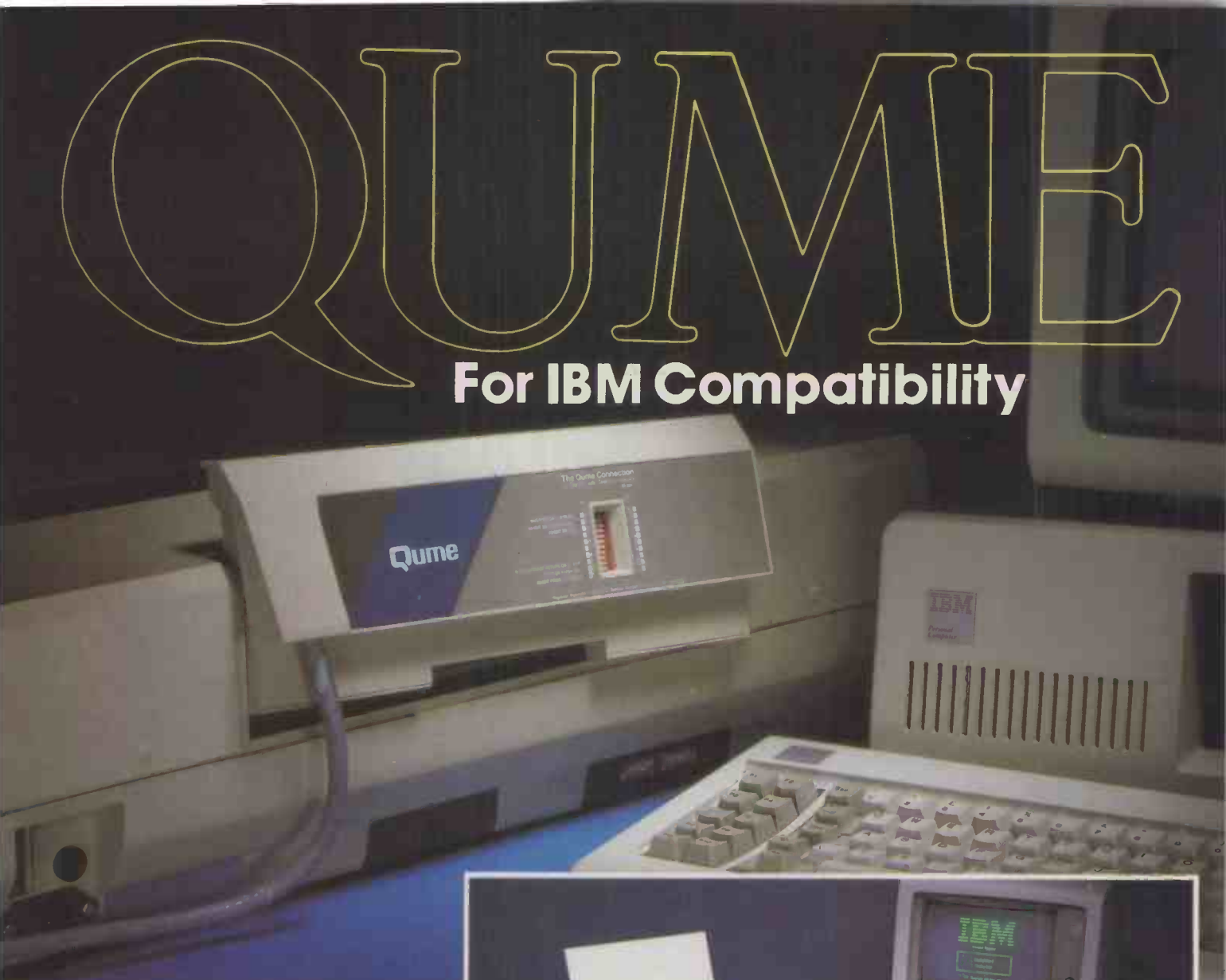
Another option Kaypro should consider is offering a back-lit LCD screen like those used in the Zenith Z-171 and Sharp PC-7000 micros. Backlighting greatly enhances the readability of even quite small LCDs. Both of these developments might open up a market for the Kaypro 2000. At present, nice though the machine is, its chances must be slim.

CONCLUSIONS

■ The Kaypro 2000 is one of the best battery-powered full-spec portables yet released.
■ The bundled software makes the Kaypro good value to people who need this type of machine.
■ The screen is not legible enough for this to be a first-choice microcomputer purchase. With a back-lit LCD option it would earn a wider following. PC

QUME

For IBM Compatibility



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MAC CHARLIE
IMITATING IBM

By Ian Stobie

Most top modern software packages run on either the IBM PC or the Macintosh, but few run on both. Mac Charlie brings the two rival camps together.

Mac Charlie uses a direct physical approach to bringing the Mac and IBM PC worlds together. It is a complete IBM-compatible computer, minus the screen. You fit the hardware to the Macintosh and then you can run either Mac or IBM software, displaying both on the Mac screen. The idea is that there are lots of people who really want Macintoshes, but are compelled by company policy to get an IBM compatible. With Mac Charlie you can have both — for a price.

Mac Charlie is available in two versions, a single-drive system with 256K RAM for £1,650 plus VAT and a twin-drive 640K system for £2,450. So the price of a reasonably powerful Macintosh system with Mac Charlie is around £4,500. At such prices Mac Charlie is unlikely to appeal to many individual purchasers. But if you really want to run both Mac and IBM PC software the only alternative is to have both machines.

When you get it out of its packing Mac Charlie looks somewhat ridiculous. However, the system fits together in a straightforward fashion and it works when you turn it on. The Mac main unit sits on a baseplate which holds it next to Mac Charlie's disc-drive unit. The same box also houses the RAM and the 8088 processor.

Your existing Mac keyboard slides into a keyboard expansion unit which comes with Mac Charlie. The result is an IBM-style keyboard with function keys and numeric keypad. The keyboard unit is excellent; it matches the Mac's existing keyboard exactly, both in construction and feel. This is unsurprising as Mac Charlie's manufacturer, Dayna Communications of Utah, gets its keyboard from Alps, the same supplier as Apple.

Mac Charlie comes with two system discs, one 3.5 in. disc for the Mac and a 5.25in. for the IBM side of the operation. You boot up from the Mac disc, and a menu comes up on a Mac-style screen. From this you select either Mac's Finder, and run a Mac application in the normal way, or you boot MS-DOS from the 5.25in. disc.

MS-DOS comes up inside a normal Macintosh window on the Mac screen. The MS-DOS supplied with Mac Charlie is the latest version, MS-DOS 3.10. Inside the window you can run IBM software and issue MS-DOS commands; outside the window a normal Macintosh environment remains, with Mac pull-down menus along the top of the screen.

You cannot run both Mac and IBM programs at the same time, but you can use Mac desk accessories and most Mac editing commands inside the MS-DOS window. For example, you could bring up the Mac calculator over WordStar and paste results into your document. You can also use the Mac notebook to store MS-DOS commands. Anything pasted in from the Mac world outside the MS-DOS window is interpreted as input from the keyboard, so the pasted commands are acted on immediately.

Communication between the environments is text only, and you cannot paste Mac graphics. We ran Supercalc 3 and various IBM word processors without any trouble. We were able to transfer IBM text files across to Macwrite, where graphics can be added and founts changed.

Mac Charlie does have one major limitation: it only emulates the basic IBM monochrome/text environment, not graphics. Consequently you cannot run Windows, Gem or other software which depends on extended graphics or colour. Neither will you be able to get the best from some standard packages. We got only rudimentary charts from Supercalc and no charts at all from Lotus 1-2-3. However, for the time being the majority of IBM software works in the standard monochrome text environment.

MAC CHARLIE

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	☐	■	☐
Documentation	☐	☐	■	☐
Value for money	☐	■	☐	☐

☐ If you want a Mac but your company has a "buy IBM" policy Mac Charlie is probably the answer.

SPECIFICATION

Description: IBM-compatible add-on computer for the Macintosh; main box with Intel 8088 processor, 256K or 640K of RAM, one or two 320K 5.25in. floppy-disc drives
Keyboard: add-on unit with 10 IBM-style function keys and a numeric keypad, fits around Mac's existing keyboard
Display: uses Mac's 9in. screen
Expansion: optional expansion chassis which will not take graphics or colour cards
Software in price: MS-DOS 3.1, GWBasic, file-transfer utilities
Manufacturer: Dayna Communications, Salt Lake City, Utah, U.S.A.
Price: £1,650 plus VAT with one drive and 256K; £2,450 with twin drives and 640K
U.K. supplier: Technology Advancement (U.K.) Ltd, Unit 1, Ashfield Road, Salisbury, Wiltshire SP2 7EW. Telephone: (0722) 338484
Available: now

CONCLUSIONS

■ Although the concept is unusual Mac Charlie is well made and it works. Apart from the inability to handle graphics or colour, IBM compatibility seems to be good.
■ If you want Mac Charlie purely for copying data between the Mac and an IBM PC there are cheaper solutions.
■ Mac Charlie is primarily intended for corporate markets, where it will probably sell in reasonable quantities — at the same time adding to the Macintosh's credibility as a serious business machine. PC

BENCHMARKS

Mac Charlie runs the standard Basic Benchmarks slightly faster than the IBM PC. We were using the GWBasic supplied with Mac Charlie running under MS-DOS 3.10. Application packages appear to run more slowly on Mac Charlie than these figures suggest because screen updating takes longer than on an IBM PC.

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Mac Charlie — 8088	1.1	4.4	9.8	10.2	11.1	21.2	31.5	33.2	15.3
IBM PC — 8088	1.2	4.8	11.7	12.2	13.4	23.3	37.4	30.0	16.8

Together with its accessory packages, Borland's implementation provides a fast, comprehensive program-development environment.

TURBO PASCAL 3.0
THE ACCEPTABLE FACE OF PASCAL

By Barry Clark

SPECIFICATION

Description: full-feature Pascal environment comprising editor, compiler and run-time library
Runs on: IBM PC, MS-DOS, Apple II
Publisher: Borland International, Scotts Valley, California, U.S.A.
U.K. suppliers: Softsel, telephone 01-568 8866; P & P Micro Distributors Ltd, telephone (0706) 217744
Price: Turbo Pascal £60; Turbo Tutor £30; Turbo Toolbox £47; Graphics Toolbox £47
Availability: now

Borland's Turbo Pascal is one of the most comprehensive stand-alone implementions of a Pascal development environment yet to appear. It comprises a full-blown text editor, a Pascal compiler and all necessary run-time functions in only 39K of code. For around £300 you can equip yourself with a fully fledged integrated development system.

If you have 256K of RAM you can hold up to 64K of text in memory, and edit, compile and run it without exiting to DOS. Obviously this is fast. One of my 2,300-line database programs compiles in about 40 seconds including reading in about 1,000 lines of Include files from a hard disc. Pressing R then instantly runs the compiled version; no linking procedure is required.

Turbo Pascal also deals with errors in a particularly convenient way. If a compiler error is detected, the compilation automatically restarts in diagnostic mode. When the error is found, the editor is activated and the cursor is placed at the point of error, along with a suitable message. If a run-time error occurs, the compiler is automatically activated — the source code being still in memory — and again the cursor is placed where the system thinks the error occurred.

When the program is ready you can save the compiled version as a Com file, via an easily selected menu option. It can then be executed as a stand-alone program. If an error occurs, you simply note the program counter readout, load the original source program and use the Find option to detect where the error occurred.

The programs Turbo Pascal produces are compact. The run-time library only adds a 12K overhead to whatever you produce, compared to 35K for IBM Pascal. You are restricted to a maximum of 64K code per program Com file, but you can circumvent this very neatly by using CHN files to chain to relevant parts of the package. Alternatively you add an Overlay tag to a procedure declaration and Turbo will handle the overlay structure for you. Version 3.01 will even let you activate overlays while running in memory mode, and will also trace any errors which occur in the overlay files. Full support is provided for DOS 2.00 directories, and reading command-line parameters.

Like most other implementations Turbo Pascal adds string types to the traditional Jensen and Wirth language, along with a set of functions and procedures for string manipulation. The STR() and VAL() functions act like their Basic equivalents and seem unique to Turbo.

Turbo provides excellent screen handling and DOS access features. It is possible, for example, to interactively insert or delete complete lines, return the cursor position, delineate screen windows, and set text foreground and background colours. With Microsoft and IBM Pascals you are dependent on third-party packages for screen handling.

There can be little doubt that Turbo is fast, but Borland's reported benchmarks should be interpreted with caution. To test Borland's claims that "execution speed is a real plus over other compiled programs" I took a seven-point spline curve-fit with 100 back interpolations, transcendental evaluations and sequentially writing/reading 1,000 40-character records to floppy disc. I then used Turbo Pascal and IBM version 2.00 Pascal with and without 8087 support, and compared these with interpreted and compiled Microsoft Basic.

The spline program occupies 200 lines. Turbo gives a very fast compilation and the program is then ready to run. With IBM Pascal development is exceedingly tedious, and Basic compilation is no hare either. Turbo executes more slowly than both IBM Pascal and compiled Basic, so where does this leave Borland's claims? Turbo executes the transcendental evaluations faster than IBM Pascal. The program chosen by Borland includes transcendental evaluation, and this is why it runs on faster on Turbo. The spline program, which uses only reals, does not show an edge over IBM Pascal. Use of Turbo 87 has no effect on real-number processing, so don't buy it unless you really need it. Turbo really flies on disc accessing.

TURBO EXTENSIONS

Two very useful extensions of Turbo are supplied as Borland's Toolbox. The first is an ISAM package which is simply Included in your applications package. I was recently asked to write a full-feature orders management package at short notice. After eight hours work with Turbo Pascal the first orders were being printed and booked in from a relational database of four data files and six index files. File access is fast: a sequential, multiple conditional search through 200 193-character records took about two seconds; keyed access is about 0.1 second per index per record retrieval. Unfortunately, under certain conditions, there seems to be a problem with heap management which causes strange side effects on the database files. This is presently under investigation by Borland, and should certainly not deter you from trying the routines. If databases are your area, you will not be disappointed. Ensure that you use version 1.01 of the Toolbox and 3.00 or higher of Turbo.

Toolbox also contains a very smart application of the Quicksort procedure. It is very easy to use and fast. Sorting priorities are determined by a user-written function Less, which can be as simple or as complex as required.

Turbo Pascal caters for graphics with a UCSD-equivalent turtle graphics. This can be augmented by Borland's Graphics Toolbox, a set of routines which offer true windowing, the ability to move windows on the screen, and simple calls for pie charts, histograms, curve-fitting and point plotting.

TURBO PASCAL

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	☐	■
Ease of use	☐	☐	■	☐
Documentation	☐	☐	☐	■
Value for money	☐	☐	☐	■

☐I have never worked in a better environment — a bargain at £60. Only the Graphics Toolbox is less than excellent.

```
program TurboTester;
Const
     MaxIterations = 10000;        {conventional constant}

Var                          {variables used by program must be explicitly }
          i : integer;               {  declared by name and by type }
 Arg, Result : real;
Start,Finish : real;
{*********************************************************************}
Function Time: Real;

Type                         {Note ALL DOS registers available to Turbo}
 RegisterPack = record
                case integer of
                    1: (AX,BX,CX,DX,BP,SI,DI,DS,ES,FLAGS: integer);
                    2: (AL,AH,BL,BH,CL,CH,DL,DH         : byte   );
                end;
Var
       RecPack : RegisterPack;
  Hour,Min,Sec : String[2];

begin
 RecPack.AX:= $2C00;        {Note AX is prefixed with record identifier}
 MsDos(RecPack);
 With RecPack do            {WITH neatly lets you omit RecPack. prefix }
  begin
    {Borland's exotic way of getting the time}
    str(CX shr 8,hour);                                 {convert to string}
    str(CX mod 256,min);                                {note use of 'bit'}
    str(DX shr 8,sec);                          {operator 'shr' (also shl) }
    writeln('Time: ',hour+':'+min+':'+sec);

   {Now my Plebian (easier, more obvious??) way}
          {hours}    {mins}      {secs}     {hundreds}
    Time:= CH*360.0 + CL * 60.0 + DH*1.0 + DL/100.0;
  end;  {with}
end;     {Function Time}
{---------------------------------------------------------------------}
begin   {Main Program TurboTest}

Arg:=5.40;
Start:= Time;  {Time is returned as real number }
{ Do test.......}
for i:=1 to MaxIterations do
  begin
    if (i mod 100) = 0 then write('.');    { let user know I'm alive }
    Result:=Exp(Arg);                       { take natural exponent }
  end;
{Test Done......}
Finish:=Time;
Writeln; Writeln;
Writeln('Time Taken = ',(Finish-Start):9:2,' secs.  Result = ',Result:9:2);

end.      {Main Program TurboTest}
```

Access to DOS is through interrupts and MS-DOS procedures. This routine illustrates the use of MSDOS() to recover the system time in a benchmarking program.

```
Program SimpleWindow;
{_____________________________________________________}
procedure HELP;
var
  buffscrn : array[0..3997] of char;
  screen : array[0..3999] of char absolute $B000:$8000;
  i,j,index:integer;

procedure savewindow(x1,y1,x2,y2:integer); {local to HELP}
var i,j :integer;
begin
 for i:=y1 to y2 do
    for j:=x1-1 to x2 do
      begin
        index:=(i-1)*160 + j*2;  {get offsets from IBM tech ref p 1-96}
        buffscrn[index]:=screen[index];  {save character}
        buffscrn[index+1]:=screen[index+1]; {save attribute, ie textcolor}
      end;                                  { textbackground etc,
  end;

procedure Restorewindow(x1,y1,x2,y2:integer); {local to HELP}
var i,j :integer;
begin
 for i:=y1 to y2 do
    for j:=x1-1 to x2 do
      begin
        index:=(i-1)*160 + j*2;
        screen[index]:=buffscrn[index];  {restore character}
        screen[index+1]:=buffscrn[index+1]; {restore attribute}
      end;
  end;
{-------------------------------------------------}

begin
   fillchar(buffscrn,SizeOf(buffscrn),0);  {clear out screen buffer}
   SaveWindow(5,3,40,20); {save a selected screen area}
   textbackground(red);
   Box(5,3,40,20,yellow);  {from my toolbox, draws a box }
   Window(6,4,39,19); {create an active window inside the box}
   textbackground(black);
   textcolor(yellow);
   ClrScr;
   textcolor(White);
   Writeln('This is a HELP screen');
   delay(2000); {pause}
   Restorewindow(5,3,40,20); {restore screen to original contents}
   TextBackGround(Blue);
end;
{-------------------------------------------------}
Begin
  Textbackground(Blue);
  GraphBackground(Blue);
  ClrScr;
  Help; {show help text, then restore screen as it was before}
end.
```

A very neat feature is the ability to declare variables at absolute memory locations. This routine shows how to introduce help text without ruining your carefully designed screen layout. An array of type Char is declared on top of the colour-graphics screen area. It is then possible to save an area of screen to another character array, display the text and then restore the screen exactly as it was.

BENCHMARKS

Timings in seconds for Turbo Pascal and IBM Pascal with and without 8087 co-processor support. Interpreted and compiled Microsoft Basic timings are given for comparison.

	Turbo	Turbo 87	IBM Pas	IBM 87	Basic	Bascom
Spline compile	4.8	4.4	115.8	115.8	—	31.0
Spline link	—	—	48.1	48.1	—	8.0
Spline run	5.7	5.4	4.0	2.0	14.1	2.2
10,000 EXP()	124.4	8.2	250.0	8.2	94.2	44.7
1,000 seq. floppy R/W	33.2	—	51.0	—	56.5	38.3

The Graphics Toolbox has some disappointing features that may prevent my using it as much as I would like. It runs only in high resolution, so the system is effectively monochrome; changing the foreground colour updates the whole screen. Support for low-resolution, full-colour graphics would have been invaluable. Window headers use a diminutive four-by-six text fount, which is illegible on colour systems, though acceptable on a printout. Finally, on the latest version Borland has inverted the World Co-ordinate system so that it appears upside down.

For applications that require networking and other comms support Blaise Computing supplies Turbo Asynch. This powerful set of routines provides an interrupt-driven communications system where incoming data is automatically buffered until required, with full support of XOn/XOff handshaking. The system will easily support 9,600 baud, and the buffer can be set to any reasonably required size. A full set of procedures read and write individual characters, strings and blocks of characters. My only regret is that it does not appear possible to link a procedure to the interrupts generated when data appears on the comms ports. This is Basic's last stronghold: a simple On Comn Gosub statement forces a branch to a comms handler whenever activity is detected. With Turbo Asynch, you must scatter statements liberally among your code if you wish to provide rapid response. Nevertheless, the package is well worth having and its documentation excellent.

Want to learn Pascal? Then start off with Turbo Pascal and the Turbo Tutor. This is a well-written Borland teaching manual with accompanying sample programs on disc which takes you through the many facets of Pascal. There is an advanced section that deals with MS-DOS calls, and also calling assembler programs from within Pascal. You would eventually need to supplement it with more advanced books, but it provides a perfectly adequate grounding.

Borland's excellent Turbo Pascal documentation is slanted towards the computer-literate but non-professional programmer. Its only shortcoming is that the manuals are bound as paperbacks which makes life difficult when you are trying to enter examples with one hand while holding the manual in the other. However, the absence of jargon makes a welcome change from Microsoft's Pascal documentation, which is virtually inaccessible to anyone but a professional programmer.

CONCLUSIONS

- Turbo Pascal is comprehensive and fast, particularly on compilation, and an ideal vehicle for fast program development.
- The Toolbox provides powerful database and sort utilities. An inability to support colour detracts from the usefulness of the Graphics Toolbox.
- For newcomers to the language, Turbo Pascal plus Turbo Tutor is a combination to be highly recommended. PC

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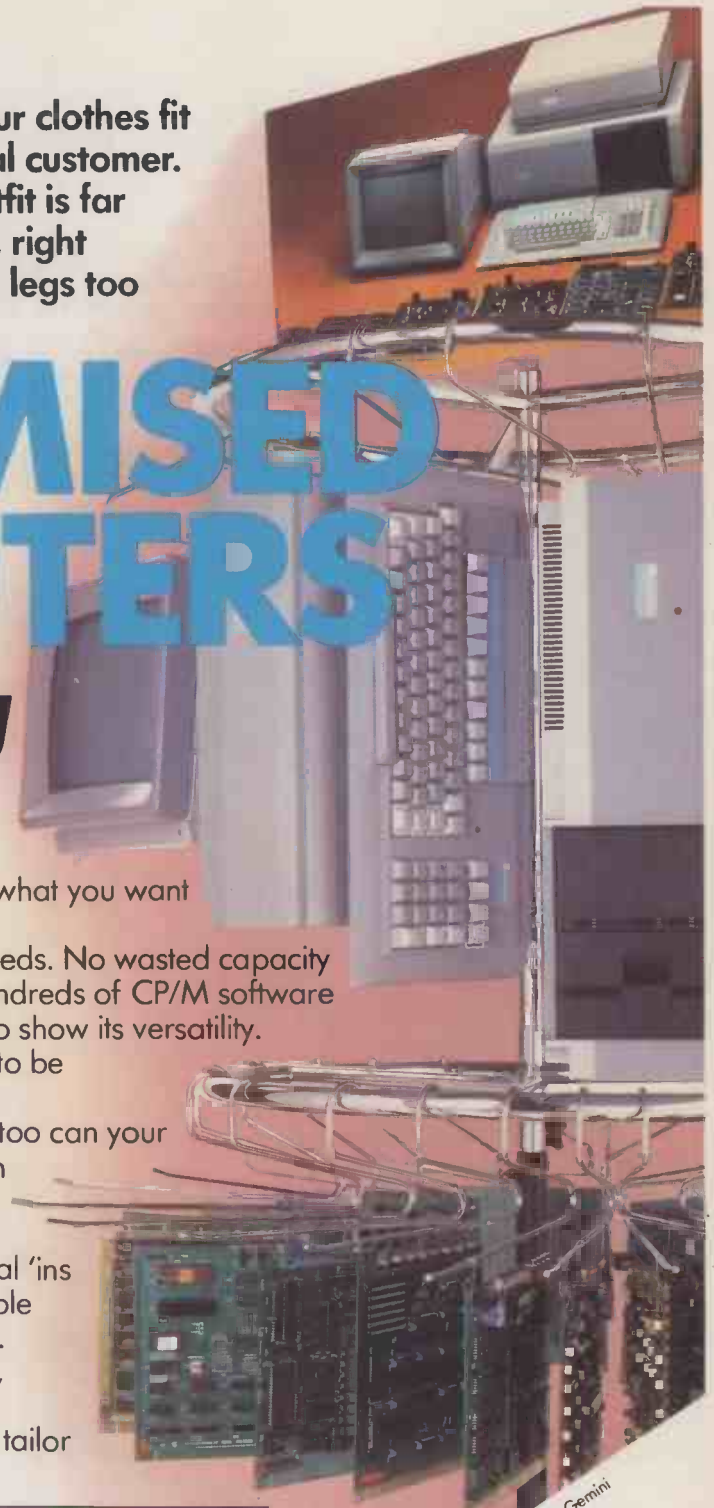

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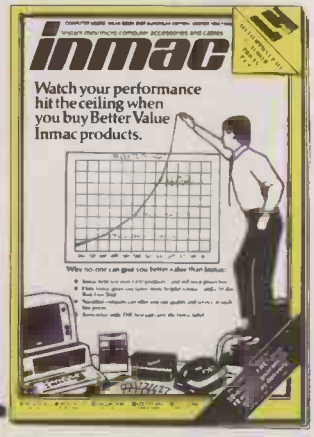

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THE PRIORITY SYSTEM
DECISIONS, DECISIONS

By Paul Myerscough

A family of three decision-support packages which help you to make rational choices when faced with conflicting restrictions and priorities.

A decision-support system brings together information from a company database, established and subjective relationships between data, factors external to the company and What-If? scenarios. The resultant output is designed to help you make reasonable decisions when faced with several choices and a number of conflicting priorities. Work Science Associates has launched three business packages that are based on this approach: Priority Decision System, Budget Priority System and Work Priority System — collectively known as The Priority System.

Of course, a computer system is incapable of deriving an inspired solution to a problem, especially one in which a number of individuals' views and priorities must be resolved. What the programs do is impose a structure on a problem to render it suitable for analysis. The three packages apply similar algorithms to the input they receive, though they express the results in slightly different ways.

There is no difficulty representing budget data or most of the constraints of a budgeting problem. There are, after all, only so many hours in a day, the resources available in a particular department are fixed, certain items have a fixed cost, and so on. But judgements are different, and it is the handling of this type of data that is one of the unique and central features of the Priority System. Judgements are about comparisons: option A is better than option B; C is most important of all; and so on. They can be recorded by rating each option arbitrarily on a scale of values: if option A has a value of 35 then B is worth 13 and C is worth 150, for example.

More reliable results can be obtained by a method known as judgement analysis. First of all, two options are taken and compared. The comparison can be verbal, such as "option A is significantly more important than option D". Options A and B are then compared, followed by B and C, and C and D, and so on until all combinations are recorded. A quantitative value is obtained for each comparison by applying a scale that attributes numerical values for the words used in the description, so "equal", "weak", "significant", "strong" and "absolute" are given values 1, 3, 5, 7 and 9. By having a score for each comparison an accurate relative rating table can be built up.

NEGOTIATIONS

Priority Decision System (PDS) received some publicity during the 1984-85 coal strike, when several members of the National Coal Board and the National Union of Mineworkers independently agreed to try the system. PDS came up with what it calculated to be the most mutually acceptable plan, and to many outsiders the options it suggested looked quite credible. However, they were not adopted, and Work Science Associates believes that the users were treating the PDS more as a negotiating aid than as a conflict solver.

PDS divides the decision-making process into three separate exercises, known as Solve a Problem, Make a Policy, and Policy into Practice. These names reveal little: the software is really concerned with the judgement of different options compared by several criteria, so "option rating", "criteria rating" and "apply criteria to options" would be better descriptions.

Although the program is designed for business use, a simple domestic problem can be used to illustrate the way it works. Suppose that a family is deciding where to go on holiday. The first step in the Solve a Problem phase is to register the options — say England, Spain, France, United States, as in figure 1. Then register the decision makers — in this case they are Mr, Mrs and Junior — and their relative influence, as in figure 2. The simplest way of doing this is to enter a percentage value. The values chosen are 40 percent for Mr, 40 percent for Mrs and 20 percent for Junior.

The final step in Solve a Problem is to record each of the family members' judgements of the different options. Once again, the simplest way of doing this is to enter a percentage value directly, but two other methods are available which arrive at a percentage result by a more analytical route.

The method known as magnitude estima-

SPECIFICATION

Description: PDS is a business package that consolidates the judgments of a number of decision makers; WPS and BPS bring similar techniques to bear on work planning and budgeting
Hardware required: IBM PC, Apricot, Sirius; PDS and WPS will also run on Apple II and III machines
Price: PDS £394.40 plus VAT; WPS and BPS £584.40 each
Supplier: Work Science Associates, 26 Southwood Lawn Road, London N6 5SF. Telephone: 01-348 5822
Availability: now

```
PROBLEM NAME: HOLID1

  ------------------------
         OPTIONS
  ------------------------
  A)  ENGLAND
  B)  FRANCE
  C)  SPAIN
  D)  UNITED STATES
  ------------------------
```

```
PROBLEM NAME:      HOLID1
CRITERION USED:    ALL THINGS CONSIDERED
METHOD USED:       INTUITIVE

  ------------------------------------------------------
  RANK        DECISION-MAKER                INFLUENCE
  ------------------------------------------------------
   1     A)  MR.                          0.400 ( 40.0% )
   1     B)  MRS.                         0.400 ( 40.0% )
   2     C)  Junior                       0.200 ( 20.0% )
  ------------------------------------------------------
        ALL DECISION-MAKERS               1.000 (100.0% )
  ------------------------------------------------------
```

Figure 1 (above): Registering the options.
Figure 2 (right): Registering the decision makers.

(continued on next page)

(continued from previous page)

tion starts with a measure of agreement. One option is held as having, say, slightly below average priority, and this is given a value of 35 by the system. On that basis, each decision maker assesses other options and assigns values to them accordingly.

In the method called judgement analysis, each decision maker scores the relative importance of all possible pairs of options, as shown in figure 3. As well as being the most comprehensive method in terms of the number of choices each decision maker has to specify, judgement analysis can also be used to collate the information and test it for inconsistencies, as shown in figure 4. The user then has the opportunity of going back to the decision makers and obtaining a more consistent set of choices.

INFLUENCE FACTORS

However they are recorded, the judgements result in a ranking table of destinations for each decision maker — see figure 5. The system can then use the previously entered influence factors to combine these into an overall team priority table. At this point a new statistic known as the agreement measure is introduced to provide an indication of whether the derived priorities are likely to be acceptable to all members of the team. An average of people's views derived in this way, while not necessarily a consensus, is a statistic in which each decision maker has had an influence.

In real life, however, decision making is approached more analytically — usually with some discussion which considers the pros and cons of each option. In other words, several criteria of comparison may be considered. The function of the Make a Policy phase is to register these criteria.

For the holiday plan such criteria might be cost, weather, excitement and potential social life. The influence of these factors on the final decision will vary, of course, as each decision maker will have different views about which criteria are more important. The criteria are rated in much the same way that Solve a Problem rates options. At the end of the exercise, a team evaluation is produced expressing each in percentage terms, as in figure 6.

The third phase, Policy into Practice, takes the basic data recorded in Solve a Problem — but ignoring any judgements that may have been recorded at that stage — and combines it with the results of the Make a Policy exercise. Each family member is thus prompted to rate the destination countries on cost, weather, excitement and potential social life. Once again, this rating may be achieved through intuition, magnitude estimation or judgement analysis. The individual ratings are finally combined to derive an overall team priority table of the options.

The basic ideas used by PDS are central to the two remaining packages, Work Priority System (WPS) and Budget Priority System (BPS). But while PDS confines itself to the manipulation of individual judgements,

FIGURE 3

```
PROBLEM: HOLID1       OPTION PRIORITY - JUDGEMENT ANALYSIS        PAGE  1  OF  1

Decide which of the two OPTIONS has the greater PRIORITY
and then use the scale below to decide how much more PRIORITY
Then type the higher PRIORITY letter and relative PRIORITY eg 'A9'

     IMMM
```

FIGURE 5

```
PROBLEM NAME:      HOLID1
CRITERION USED:    ALL THINGS CONSIDERED
METHOD USED:       JUDGEMENT ANALYSIS
DECISION-MAKER:    A)  MR.

 ---------------------------------------------------
 RANK        OPTION                      PRIORITY
 ---------------------------------------------------
  1    C)  SPAIN                      0.577 ( 57.7% )
  2    D)  UNITED STATES              0.215 ( 21.5% )
  3    B)  FRANCE                     0.152 ( 15.2% )
  4    A)  ENGLAND                    0.056 (  5.6% )
 ---------------------------------------------------
       ALL OPTIONS                    1.000 (100.0% )
 ---------------------------------------------------

CONSISTENCY MEASURE:    0.168      (Perfect Consistency is 0.000)
DECISION STANDARD: No statistics available

Please press the 'enter' key to see your MAIN INCONSISTENCY
```

FIGURE 6

```
ISSUE NAME:      HOLIDD
CRITERION USED:  ALL THINGS CONSIDERED
METHOD USED:     INTUITIVE

 ---------------------------------------------------
 RANK        CRITERIA                     WEIGHT
 ---------------------------------------------------
  1    D)  SOCIAL                     0.288 ( 28.8% )
  2    A)  WEATHER                    0.262 ( 26.2% )
  3    C)  EXCITEMENT                 0.253 ( 25.3% )
  4    B)  COST                       0.197 ( 19.7% )
 ---------------------------------------------------
       ALL CRITERIA                   1.000 (100.0% )
 ---------------------------------------------------

AGREEMENT MEASURE:      55
DECISION STANDARD: High degree of agreement between the team members
```

Figure 3. The relative importance of all possible pairs of options.
Figure 4. Judgement analysis.
Figure 5. Ranking table of destinations for each decision maker.
Figure 6. A team evaluation expresses the criteria in percentage terms.

THE PRIORITY SYSTEM

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	□	□	■	□
Ease of use	□	□	■	□
Documentation	■	□	□	□
Value for money	□	■	□	□

□Interesting decision-support tools that could prove very useful in the right hands.

WPS produces results in terms of units of production and time, and BPS is designed to handle financial calculations. Both programs take account of external constraints like maximum and minimum allocations.

BPS is designed to plan a budget, starting from a list of budget items and a total amount to be spent. The system distributes the money across the list according to the relative rating of each item. This rating is based on three factors: past spending, priority and demand level. It will also take account of overriding maximum and minimum limits on individual items.

Most of the program is devoted to deriving these ratings. Those based on past spending are the most straightforward to arrive at: provided the amounts are known, they are simply entered against each item. Priorities are concerned with judgemental information, which may come from several decision makers. Data is collected and collated just as for PDS, and the end result in a table that expresses each item's priority as a percentage of the whole set.

ESTIMATES DEMAND

The demand level, at its simplest, might be the current or forecast sales figures for each product. If no figures are available, BPS can be used to estimate demand by combining the views of several users in much the same way that priorities are decided.

Another requirement is the relative weight to be assigned to past spending, priority and demand. By default the system assumes that the weightings are equal, but you can also express each as a percentage of the whole. This provides the possibility of recalculating a budget with different emphases. For instance, a budget based on priority alone, with the weighting of demand and past spending set to zero percent, might usefully be compared with one based on past spending.

A useful feature of BPS routines is the ability to work backwards. The Monitor process allows actual figures to be recorded at the end of a budget period, and by comparing them against the original plan it can calculate implied values for priority and demand.

The Priority System series stems from several years' research work at Brunel University. During that time several customised versions have been produced, so the programs that are being released for general use have, in effect, been thoroughly field tested.

In practice the programs are easy to use. In part this stems from a conscious effort by the authors, but they have been helped by the simple nature of the data on which they operate.

AVOIDS CONFLICTS

Once options and criteria for comparison have been determined, judgements by individual decision makers can be collected on pre-printed forms. The operation of the computer then becomes little more than a data-entry exercise. As well as saving on meeting time, this approach avoids the unproductive conflicts which can occur when collective decisions are reached by face-to-face discussion.

Full documentation is supplied with all three of the programs. Only provisional versions were provided for review, but we understand the final version will be in broadly the same form. While the programs themselves are easy to use, the wordy descriptions to be found in the manuals give the opposite impression. They come across as patronising to the reader, while appearing to do a hard sell on the product. Good, simple documentation should encourage people to use a package often and to the full; it is a shame that the material supplied with this software does not do so.

Existing users of these systems include the Department of Health and Social Security, ICI and some borough councils. A key feature of the programs is the way they consolidate input from different sources, and any organisation where management is by committee is potential user. The Priority System programs could go a long way in helping such bodies in their decision-making process.

CONCLUSIONS

■PDS will be a boon as a decision-making aid for committees and political organisation. For the rest it will be little more than an interesting diversion.

■BPS and WPS are useful management tools for consolidating judgments and opinions, and translating them into the numbers of a budget or work plan.

■Operating these packages involves little more than a simple data-entry exercise.

■Documentation is poor, but users will probably manage well enough without it. PC

PREVIEW

WINDOWS
BRIGHTENING-UP MS-DOS

By Ian Stobie

Windows does more for IBM and MS-DOS machines than just add graphics and mouse control to the front end.

Windows is an extension to Microsoft's MS-DOS and PC-DOS that you load on top of your existing operating system. There it provides powerful new functions: an improved user interface, easier data transfer, and the ability to multi-task.

Microsoft is initially selling Windows to end-users directly, in a four-disc pack called Windows Premier Edition costing £95 plus VAT. Apart from the operating-system extension itself, you also get a set of desk accessories — notepad, calculator and so on — and two full-scale applications: Windows Write is a word processor, while Windows Paint is a Macpaint-style graphics program.

MAINSTREAM OS

In the longer term, hardware manufacturers will probably start bundling Windows in with their machines. It is likely to be Microsoft's mainstream business operating-system offering for some time, and whatever version of MS-DOS you have supporting it, Windows itself is likely to be stable.

Windows was originally announced nearly two years ago, and in the intervening time the product seems to have become more ambitious. It is now a good deal more than a graphic front end to take care of window management and interaction with mice, and is designed to do more than either of its direct rivals, IBM's Topview and Digital Research's Gem.

Particularly important is its ability to load several applications into memory at the same time, letting you switch quickly between them and transfer data. In this, Windows is very similar to Switcher, Apple's new operating-system extension for the Macintosh. But Windows goes further and has its own virtual-memory management system which allows you to run large single programs which break the 640K limit imposed by MS-DOS.

Windows Premier Edition comes on four discs and takes some time to install. Although the software itself is cheap, you need a lot of hardware to run it. The manual says Windows will work on a twin-floppy system, but you really need a hard disc for reasonable speed. What's more, if you are running Windows on the IBM PC you will need a graphics adaptor card, and if you want colour you need the more expensive enhanced graphics adaptor. Although you could conceivably use Windows without a mouse, we found it difficult; the system is clearly designed for one.

When you have assembled all the kit and finally got Windows running, it displays a fairly conventional disc directory which shows files as file names rather than as Macintosh-style icons. However, across the top of the screen there are icons for the different disc drives on your system, and above them a menu bar showing the name of various pull-down menus. You use the mouse to get different disc directories or to select items from the menus. To run an application you double-click on its name in the file directory. Windows opens a window for it and sets it running. When you have finished with it you can either exit completely, or just close the window.

Along the bottom of the screen is a blank area, known as the "icon area" in Windows parlance. Windows is by no means an exact copy of Apple's Macintosh, and the way you use the icon area icon has no Mac equivalent. If you choose to close the window rather than exit, the system will put an icon in the icon area at the bottom of the screen, and leave the application in memory. Windows lets you have several icons in the icon area in addition to any applications you have open on the screen. When you want to use the application again you simply drag the icon towards the centre of the screen and release the button; this reopens a window for it.

Depending on exactly where you place the icon, Windows decides where to open the new window. It automatically makes room for it, pushing other windows out of the way. The system does not allow you to overlap windows — unlike the Mac and Gem — but you can expand any particular window up to take over the whole screen whenever you like.

PIF FILES

One of Windows' great strengths is that it works well with existing MS-DOS applications, not just new ones written specially for it. Most old programs will run in a window, providing Windows has enough information about them. Along with Windows, Microsoft has provided program information files (PIF files) on disc for existing applications such as Lotus 1-2-3. You can also set up PIF files yourself.

SPECIFICATION

Description: extension to MS-DOS and PC-DOS operating systems; provides fast switching between applications, easier data transfer, graphics/mouse interface; comes with word processor and paint programs, and set of desk accessories
Hardware required: IBM PC or clone, RM Nimbus, Apricot; needs at least 256K of RAM, twin floppies or hard disc, MS-DOS 2 or later, graphics adaptor card on IBM
Price: £95 plus VAT
Publisher: Microsoft Corporation of Bellevue, Washington, U.S.A.
U.K. supplier: Microsoft Ltd, Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741. Available now

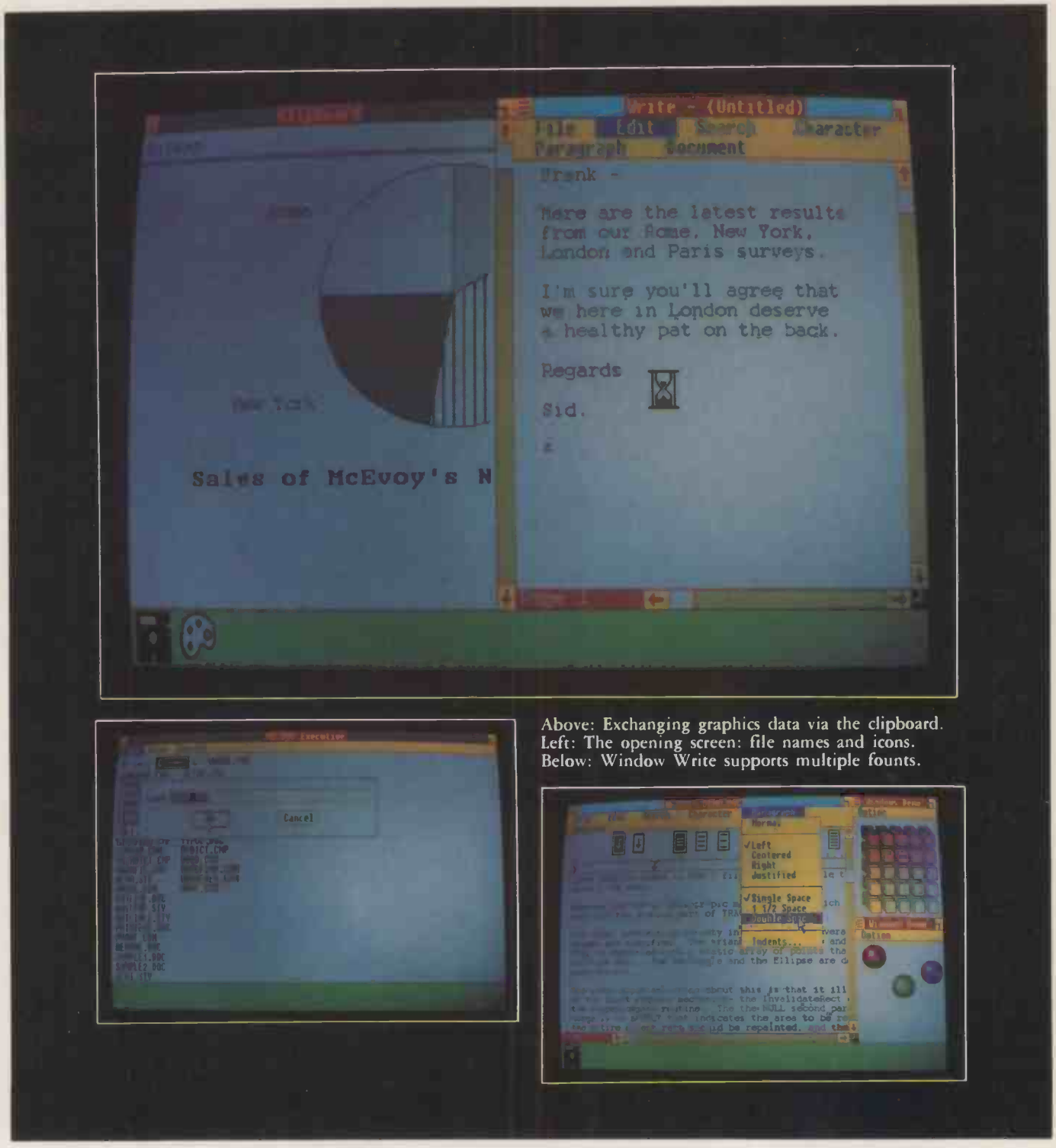
Old programs which directly modify screen memory will still run, as will those without a PIF file. Windows just gives them the whole screen area and the maximum available memory, and the application looks exactly as it always has. The clever bit is that when you quit you return to the Windows desk-top environment, not MS-DOS.

With most new programs Windows allows you to multi-task. You could, for example, have an electronic-mail program running in the background while you use a spreadsheet or word processor. If you have several windows open you can see all of them running, though you can only interact with one at a time.

TIME SAVING

One big advantage of Windows is that it lets you switch rapidly between almost all application programs. You don't have to exit the application you are in, and most of the time you will not have to load the new application into memory; Windows will already have done this when it set up the icon. The time saving can be considerable. It takes about 30 seconds to load Microsoft Word on an IBM PC/XT, but only four seconds to switch to it from most other applications under Windows. Switching back is just as fast, and you continue your first application exactly where you left off.

Windows has another important advantage over its principal rival, Gem. It provides a convenient method of transferring data between applications, using the Macintosh idea of a clipboard. You open one application and use the commands Cut or Copy to transfer information from the screen to the clipboard; if you wish you can



Above: Exchanging graphics data via the clipboard.
Left: The opening screen: file names and icons.
Below: Window Write supports multiple founts.

open another window to display the clipboard as you do this. You then open the other application, and use Paste to move the data across. The clipboard works with most applications if you are transferring text. Between some applications you can also transfer graphics.

The bundled word processor, Windows Write, is a presentation-orientated program like Macwrite. It does not compete directly with Microsoft Word as it lacks a spelling checker, mail-merge and form-letters facilities. However, it is a good tool for producing memos and short documents, and it lets you incorporate graphics from Windows Paint and use multiple type founts. Paint itself seems to be a standard paint program. If you have the hardware it will work in colour, and you can dump graphics on most common matrix printers.

Windows also comes with a set of seven small applications: calculator, calendar, clock, card file, notepad, terminal emulator and a game, Reversi. These are similar to the Mac desk accessories or the facilities provided by IBM packages like Spotlight and Sidekick. When you want them they pop up quickly into a new screen window, and you can use them alongside your other applications. These applications all multi-task: the clock ticks while you continue to word process.

CONCLUSIONS

■Windows extends MS-DOS to take advantage of the resources offered by more powerful, modern hardware.

■The Windows on-screen graphic environment is clearly superior to Topview's. It also scores in its ability to switch rapidly between different applications and to multi-task.

■Windows allows you to exchange data more easily between many existing programs. It also provides the software industry with standards for both graphics and text data interchange.

■Windows' needs a lot of hardware to run properly but it will come into its own when machines with hard discs, plenty of memory and fast processors fall in price. PC

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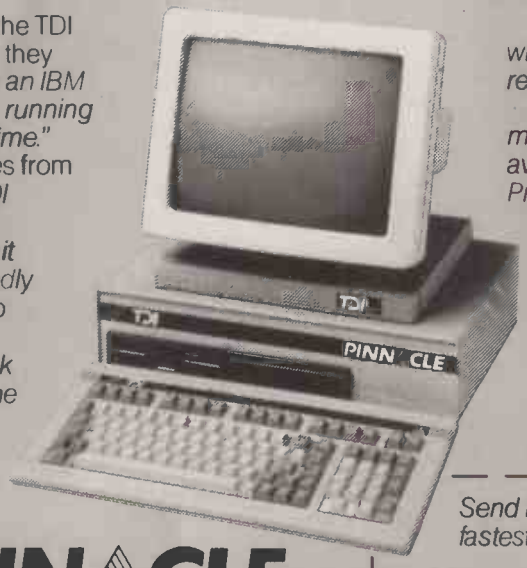

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BONNIE BLUE
CUT-PRICE WP

By Susan Curran

Do you need to pay hundreds of pounds for an IBM word processor, or can you get by with this low-cost package?

Although there are many word processors for the IBM and compatibles, not many of them cost under £100 including VAT. This is one good reason for taking Bonnie Blue seriously, since for that money you get a full-featured word processor, including a small database facility. The only major omission is a spelling checker.

Bonnie Blue has a reasonably uncluttered editing screen, with a three-line system window at the top, which can be reduced to one line if you prefer, and a line-numbering system down the side that can also be removed. The screen can be divided horizontally into two editing windows of fixed half-screen size, and it is possible to handle up to 24 different buffers full of text. The program works in memory only, and does not handle swap files which are too long to fit into available RAM. However, with the average PC, this should not be a noticeable problem.

Editing commands are handled by the function keys plus Shift, Control and Alt, sometimes followed by word commands. There is no keyboard overlay provided, though it is possible to reproduce a map of key assignments in the lower text window. The program is not primarily menu-based, but a main menu and subsidiary menus handle printing and other special tasks.

Justification is echoed on-screen, and so are underlining and boldface. More unusually, reverse video and blinking can be employed to designate other special print effects. All four features can be redefined to make full use of printer capabilities. The program is orientated towards the Epson and other dot-matrix printers, and makes it easy to use just about every feature of a printer like the FX-80.

The program overtypes text by default, but can switch to an insert mode, which initially pushes forward and then switches to a blank line. After insertions and other editing changes, it is necessary to order a reformat. The reformatting works fast but I found that the justification often produced very odd spacing which was generally changed, usually for the better, by yet another reformat.

I had great difficulty indenting the start of a paragraph which I had originally set flush left. The Backspace Delete does not work back from line to line, and I found it hard to dispose of some unwanted gaps in mid-paragraph. Reformatting has to be ordered with the cursor at the start of the paragraph if it is to work on the entire paragraph, and unless care is taken it has the exasperating tendency to dispose of initial indents.

The program is not at all page-orientated, and commands work on line basis in preference to a sentence/paragraph basis. Page breaks are not normally shown on-screen, but can be displayed in a print-preview mode, together with headers, footers, etc. These are all controlled by dot commands in WordStar fashion.

Many features of the program make it well-suited to program preparation, including the facility to turn off wordwrap and the structured indent command. There is also an undent command but I found it impossible to make this produce indented numbered paragraphs, which is its usual application.

Block Move, Copy and Delete commands work on whole lines only. There are also word and phrase cut/paste commands, but these work only within a line, so it is tricky to relocate a sentence that crosses a line boundary.

Headers and footers are well supported, though the program lacks full support for alternate odd/even headers. There is no footnote facility, and the indexing facility is so primitive as to be of little use. Printing is handled in foreground mode only.

There is a handy macro facility which makes it possible to define any key to produce a macro. However, defining a macro in mid-edit tended to destroy the last line of the document being edited.

The database is intended primarily for mail-merge operations and is neat and handy. It is not possible to select individual records for a merge operation, and I found that including records within the text played havoc with the layout.

Bonnie Blue's manual is adequate for reference but not ideal as a learning document. There are minimal learning facilities on disc.

```
This sample shows some of the failings
of Bonnie Blue's justification. I typed
the passage straight out with no
editing, and the spacing is exactly as
the program selects by default. You can
see irregularities - like the tendency
to cluster extra spaces at one end of a
line, the use of three spaces at some
points and single spaces at others on
the same line - even in this short
piece. Note that there is no automatic
hyphenation in Bonnie Blue.
```

Reformatting is fast but sometimes results in uneven word spacing. This is often improved by a second reformat.

SPECIFICATION

Description: low-cost word processor with built-in database for mail merging
Publisher: Bonnie Blue of U.S.
Price: £99.95 plus VAT
U.K. supplier: Paperlogic Ltd, 12 Nottingham Place, London W1M 3FA. Telephone: 01-935 0148
Available: now

BONNIE BLUE

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	■	☐	☐
Ease of use	☐	☐	■	☐
Documentation	☐	■	☐	☐
Value for money	☐	☐	■	☐

☐A cheap word processor with some failings but some useful features too.

CONCLUSIONS

■Though there are a few rough edges, Bonnie Blue is a reasonably competent word processor.
■The database is well executed, and a good addition to the program.
■It is particularly well suited to programmers wanting to output moderate-quality text on a dot-matrix printer. PC

ARE THE PIRATES SUNK?

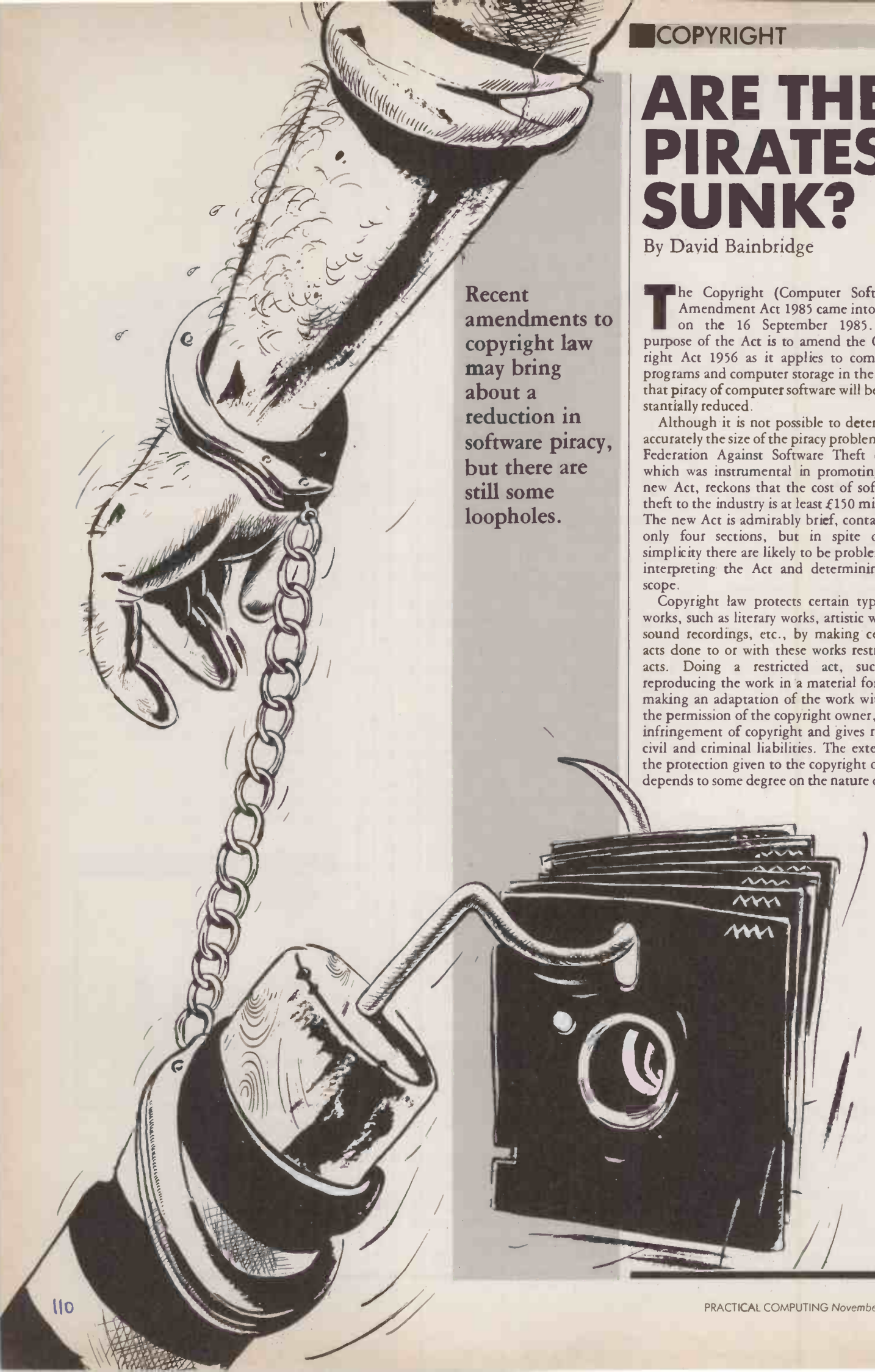
By David Bainbridge

Recent amendments to copyright law may bring about a reduction in software piracy, but there are still some loopholes.

The Copyright (Computer Software) Amendment Act 1985 came into force on the 16 September 1985. The purpose of the Act is to amend the Copyright Act 1956 as it applies to computer programs and computer storage in the hope that piracy of computer software will be substantially reduced.

Although it is not possible to determine accurately the size of the piracy problem, the Federation Against Software Theft (Fast) which was instrumental in promoting the new Act, reckons that the cost of software theft to the industry is at least £150 million. The new Act is admirably brief, containing only four sections, but in spite of its simplicity there are likely to be problems in interpreting the Act and determining its scope.

Copyright law protects certain types of works, such as literary works, artistic works, sound recordings, etc., by making certain acts done to or with these works restricted acts. Doing a restricted act, such as reproducing the work in a material form or making an adaptation of the work without the permission of the copyright owner, is an infringement of copyright and gives rise to civil and criminal liabilities. The extent of the protection given to the copyright owner depends to some degree on the nature of the



GARY WING

work; that is, whether it is a literary work or a sound recording, etc.

The new Act places computer programs in the literary work category as far as copyright protection is concerned. Section 1(1) of the new Act states: "The Copyright Act 1956 shall apply in relation to a computer program . . . as it applies in relation to a literary work and shall so apply whether or not copyright would subsist in that program apart from this Act."

This may not add anything to the position before the passing of the Act; it may simply confirm that copyright can subsist in computer programs. Although never fully tested in the courts, informed opinion was of the view that in principle copyright could protect computer programs as literary works. The Whitford Committee was set up to review copyright law, and in its report in 1977 the Committee felt that computer programs were probably already protected by copyright but noted a lack of clarity in the law.

NOT VIABLE

The greatest doubts concerning the copyright protection of computer programs arose from the fact that they can be stored and copied in a non-viable form. A computer program stored on a magnetic disc or tape cannot be seen, directly at least, by the naked eye. This created problems both in the U.S. and Australia, and was highlighted in the Australian case of Apple Computer Inc. v. Computer Edge Pty Ltd (1984), in which it was held that literary copyright did not subsist in the programs in question. Although this case was overruled on appeal by a majority of two to one, the Australian government quickly passed amending legislation in the form of the Copyright Amendment Act 1984. It confirmed that computer programs are protected by copyright regardless of the manner in which they are stored.

The new U.K. Act deals with this problem in two ways. First, by broadening the meaning of the restricted act of adaptation with respect to computer programs. Secondly, by widening the scope of the term "material form" to include storage in a computer. The meaning of adaptation in the context of computer programs is declared by the new Act in Section 1(2) as being a version of the program in which it is converted into or out of a computer language or code, or into a different computer language or code. While this covers many operations such as compiling a program into object code or running a source-code program with the aid of an interpreter, what of a direct copy made from disc to disc or from tape to tape ? The word "conversion" connotes that some alteration has to be made, but much pirated software involves a direct copy of the original.

A copy made using a computer, either by using dual disc drives or by loading a program into the computer and then storing it on a disc or tape, will require storage of the program, perhaps only a small part at a time and perhaps only briefly, in the computer. Section 2 of the new Act makes it clear that storage of a computer program, or any other work for that matter, is a restricted act. Section 2 states: "References in the Copyright Act 1956 to the reduction of any work to a material form, or to the reproduction of any work in a material form, shall include references to the storage of that work in a computer."

So if a program is copied disc to disc using, for example, the CP/M command Pip, this will involve temporary storage of the program in a computer. If the copy is unauthorised then copyright will be infringed. Section 2 also means that if a computer programmer enters a new program directly into the computer, off the top of his or her head, that program will immediately have copyright protection, as long as it is not simply trivial.

But if a computer program is stored on a cassette tape and is copied on to another tape using a dual-tape cassette recorder, there is no storage in a computer involved and there is no conversion, since the copy is a duplicate of the original. Therefore, a copy of a computer program made tape to tape may not be caught by the new Act.

However, in this instance other areas of law may be applicable. If the copy is dressed up to look like the original with, say, packaging mimicking the genuine article, then an offence under the Trade Descriptions Act 1968 may be committed. Alternatively, it might be possible to make out a charge under the Forgery and Counterfeiting Act 1981. According to Section 8(1)(d) of the Act the term "instrument" includes a disc, tape soundtrack or other device on or in which information is recorded or stored by mechanical, electronic or other means.

Where an infringing copy of a computer program consists of a disc, tape or chip or other device, Section 3 of the new Act makes available the stronger criminal penalties first introduced for audio and video piracy by the Copyright (Amendment) Act 1983. Therefore, making a pirate copy of a computer program or importing such a program into the U.K. carries a maximum penalty of two years imprisonment and/or a fine. Whereas selling or hiring or advertising or possessing by way of trade an infringing copy of a computer program can be punished with a fine up to £1,000 and/or a maximum of two months imprisonment. Copyright law provides for civil remedies; the owner of copyright can sue for an injunction, damages or an account of profits, in addition to damages for conversion.

BACKUP COPIES

A legitimate user of a computer program has a natural desire to take backup copies of the program in case the original becomes faulty or is damaged. This is a genuine need; discs do occasionally refuse to load or the data on them becomes corrupted, and if this happens another copy of the program will be required at once, especially in a business environment.

As the new Act stands, a person having properly bought or leased a computer program is in breach of copyright if he or she takes a copy of the program, unless permission to do so is given in the contract. It is a pity that the new Act did not follow the Australian legislation which specifically makes a presumption that a purchaser or licensee of a computer program can take copies of the program to be used as backup copies in the event of the original becoming damaged or otherwise unusable. The owner of the copyright in the program may rebut this presumption by way of an express term in the contract, but runs the risk of making the product less viable by doing so.

DOUBLE CASSETTES

One of the problems facing the computer software industry is the relative ease with which many programs can be copied. Technological anti-copying devices and techniques can be expensive, make software more clumsy and inconvenient to use, and can deter potential buyers. At the lower end of the market, most home-computer programs on cassette tape can be simply copied using a home stereo system with twin tape decks. However, in a recent ruling in the High Court, it was held that advertisements by Amstrad of home stereo equipment capable of copying pre-recorded cassettes at twice normal speed, without adequate warnings against infringement of copyright, and the sale of such apparatus, were authorisations for infringement of copyright by purchasers using the equipment for home taping.

This does not mean that dual tape-deck stereo systems are illegal; the ruling hinged on the way the advertising for the equipment seemingly encouraged copying. For example, by using phrases such as "make copies of your favourite cassettes". However, the case could have implications for those companies who sell utility programs designed to get round protection techniques. These utility programs are ostensibly sold as being for the purpose of copying your own programs but their true use is fairly obvious. It could be argued that the sale of such programs is either an incitement, authorisation, or even perhaps a conspiracy to infringe copyright.

All in all, the new Act is a welcome step in the recognition of property rights in computer software, but it is only an interim measure pending a full review of copyright law that will take place next year. Most of the possible weaknesses in the Act may be clarified by judicial interpretation, and in any case, other areas of law such as Trade Descriptions may be applicable. If the Act does prove effective, the pirates may become more sophisticated and take to making alterations to the programs they copy in an attempt to conceal the true origin of the program. If this happens, then there will be a shift in emphasis from questions pertaining to the subsistence of copyright in computer programs to evidential questions, such as determining whether an alleged copy was pirated from the original program. PC

Win an HP laser printer

Faster and quieter than daisywheels, laser printers look set to take over the top end of the PC printer market. Now you can win one in the *Practical Computing* Hewlett-Packard Laserjet competition!

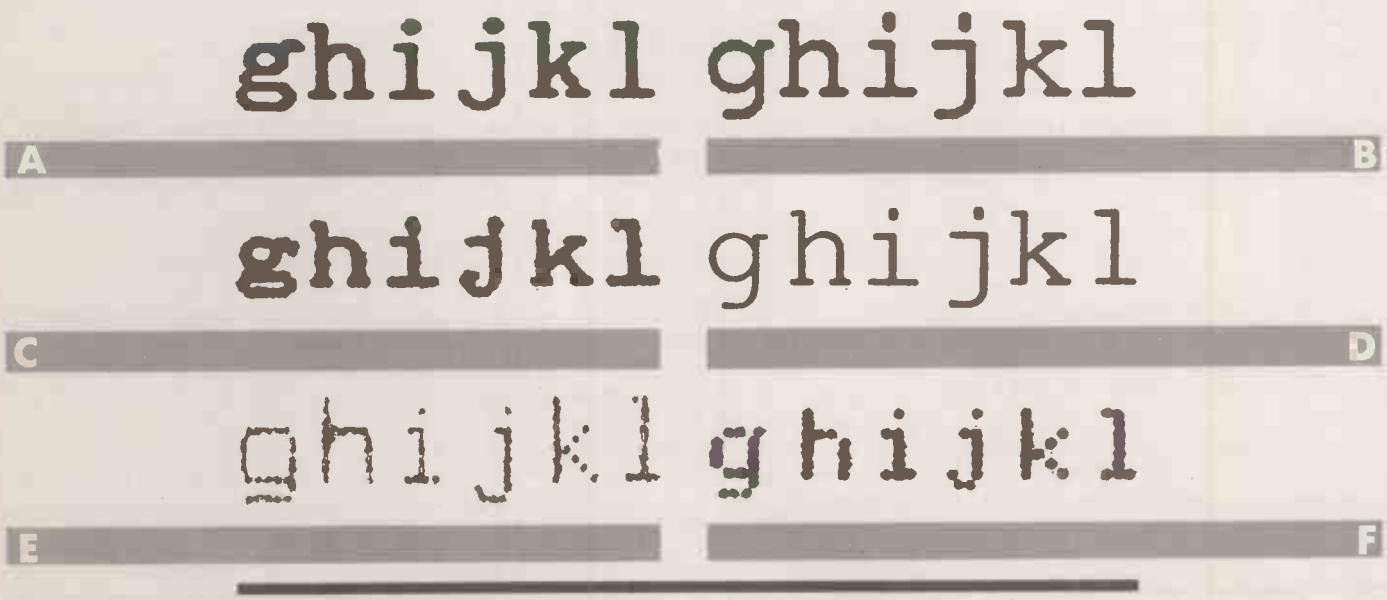
Laser printers give high-quality results on a par with daisywheel printers, but they have several big advantages. Based around similar technology to modern office photocopiers, they are far quieter than a daisywheel in operation. Laser printers are also quicker, printing a whole page at a time. The HP Laserjet produces eight pages a minute, which is about the equivalent of 300cps — three times the speed of the very fastest daisywheel and around 10 times as fast as an average one.

At a price of £2,664 plus VAT, the Hewlett-Packard Laserjet is probably the best-value laser printer available on the U.K. market. It offers great print-time flexibility, allowing you to mix a variety of type styles and graphics on the same page. It will work with any machine with an RS-232 port. You can use the Laserjet to emulate an ordinary daisywheel printer, and this allows you to run most of your existing software. But increasingly, the more important business packages such as Lotus 1-2-3, Framework and Microsoft Word will support the full range of features offered by the printer.

The running costs of the Laserjet compare favourably with a daisywheel printer. The Laserjet prints on to ordinary photocopier paper, and can also be used to produce overhead transparency slides. HP's machine uses the popular Canon printing mechanism, which has a throwaway print drum you discard after 3,000 or so printed pages. The cost per page works out around 4p, taking both paper and replacement of the drum into account.

Here is how you enter the competition. First match the six output samples reproduced on this page to the type of printer which produced them. For example, if you think sample A was produced by an ink-jet printer, put an A in the box next to "Ink-jet printer". Then complete the tie-breaker, and finally fill in the rest of the form and send it to us to arrive not later than 31 December 1985.

The winning entry will be the one which in the judge's opinion provides the correct answers and the most original and witty suggestion for the tie-breaker. Thanks to Hewlett-Packard Ltd for putting up the excellent prize.



The £3,000 prize: HP's Laserjet printer

Speed: eight pages per minute **Print quality:** 300 dots per inch resolution **Noise:** less than 55db(A) **Printer facilities:** built-in Courier fount, optional plug-in fount cartridges, landscape and portrait-orientated printing, 59K buffer, whole-page graphics at 75 dots per inch, part-page graphics up to 300 dots per inch **Paper type:** ordinary A4 photocopier paper or pre-printed letterheads; also envelopes and overhead transparency film via manual feed **Interface:** RS-232C, connects to most micros **Usual price:** £2,664 plus VAT

Rules

1. The competition is open to all readers of *Practical Computing* normally resident in the U.K., except for employees of Business Press International Ltd or Hewlett-Packard Ltd or their families.

2. Each entry must be written in ink on the official entry form printed here, or a photocopy. Only one entry per person is permitted.

3. Completed entry forms should be posted to the address shown on the entry form, to arrive not later than 31 December 1985. Envelopes should be clearly marked "Laser Competition" in the top left-hand corner.

4. The editor of *Practical Computing* is the sole judge of the competition. No correspondence can be entered into regarding the results, and it is a condition of entry that the decision of the judge is final.

5. The winner will be notified by post and the result of the competition announced in the first available issue of *Practical Computing*. All entries become the property of Business Press International Ltd, and may be reproduced without payment.

6. The prize is a Hewlett-Packard Laserjet printer. No cash substitute will be offered. The prize will be awarded to the individual named on the winning entry form.

Entry Form for Practical Computing HP Laserjet Competition

Tie-breaker

The word "laser" is actually an acronym for Light Amplification by Stimulated Emission of Radiation. This is frankly a bit dull. Imagine you have been commissioned to think up a catchy new acronym for the word "laser" to be used in promoting the Laserjet. Write your suggestion below. Don't worry about absolute, literal accuracy.

L.....

A.....

S.....

E.....

R.....

I think the output samples were produced on the different sorts of printers as follows (place one letter A-F in each box)

- ☐ **Laser**
- ☐ **Ink-jet**
- ☐ **Thermal transfer**
- ☐ **Standard-mode impact dot-matrix**
- ☐ **NLQ-mode impact dot-matrix**
- ☐ **Daisywheel**

NAME.....

ADDRESS.....

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Return this entry form to **Practical Computing, Room L307, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.** Write "Laser Competition" on the top left-hand corner of the envelope.

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● Circle No. 185

Glyn Moody introduces our selection of multi-user micros and questions whether they are always the neat solution they seem.

MANY HANDS MAKE LIGHT WORK

As the power of the micro increases, so multi-user processing becomes increasingly attractive. After all, nobody is likely to need all of the chip's attention all the time; it would clearly be sensible to share it out to several users as and when they need it.

Such an approach has been made almost official by the potential multi-user capabilities of the IBM PC/AT. It is clear that future versions will offer some kind of limited multi-user function. Although IBM is holding back, a recent AT clone from Northern Telecom, the Vienna AOC, already offers Xenix running up to five users. Others seem likely to follow.

But long before this most recent generation of machines, there had been a very healthy trade in multi-user micros. Some, like the LSI Octopus, used an ordinary 8088 to handle all the users. With the appearance of the 68000 processor came a clutch of machines designed to capitalise on its new levels of price performance. Many used Unix: for example, machines from Altos, Armstrong, NCR, Stride and Wicat. Some, like the Aston Crystal, used the more exotic Pick operating system. But by far the largest proportion of machines in this sector both then and now have been based around the S-100 bus.

The reasons are not hard to find. The S-100 works on the principle that starting from a card cage and a backplane with the physical implementation of the S-100 circuitry, you simply plug in features as and when you need them. So, for example, you might begin with a processor, I/O ports, and floppy-disc controller, and then upgrade at a later stage to hard disc, a co-processor and so on. Clearly this lends itself to the gradual addition of further users as and when they are required.

One advantage of this approach is that you are not tied to any particular processor or operating system. So it may well be possible to upgrade a machine through different chips and operating systems. Perhaps even more attractive is the facility for mixing processors.

This forms the basis of multi-processor, multi-user systems. Progressively loading a single chip with additional users inevitably leads to a degradation of response for everyone on the system. With multi-processor micros, each extra user board comes equipped with its own dedicated processor. The system chip then acts as a co-ordinating master processor handling I/O functions and other general housekeeping duties.

As the following pages indicate, this approach has been widely used, particularly by British firms. The attractions of the S-100 bus are its standard formats and the ready availability of components. Generally speaking, it is also easier to develop bus-based systems rather than starting completely from scratch.

There are other reasons why British manufacturers figure so largely in this sector when they are almost extinct elsewhere. Multi-user systems tend to be used in small businesses, who are often looking for a total solution of their computing needs. Post-sale backup is particularly important, and local or at least indigenous firms are often better placed to meet this need. The same goes for software provision, which is more problematic than with stand-alone micros.

The big rival to multi-user systems is, of course, networking. It has the same flexibility together with a number of particular advantages. For example, you can often hook up machines which are already in the company, and which may even be different and otherwise incompatible. Installation is usually a simpler affair. A basic local area network based on a ring or bus topology has to be set up only once. Multi-user systems will normally involve more complex wiring which may have to be changed if locations change.

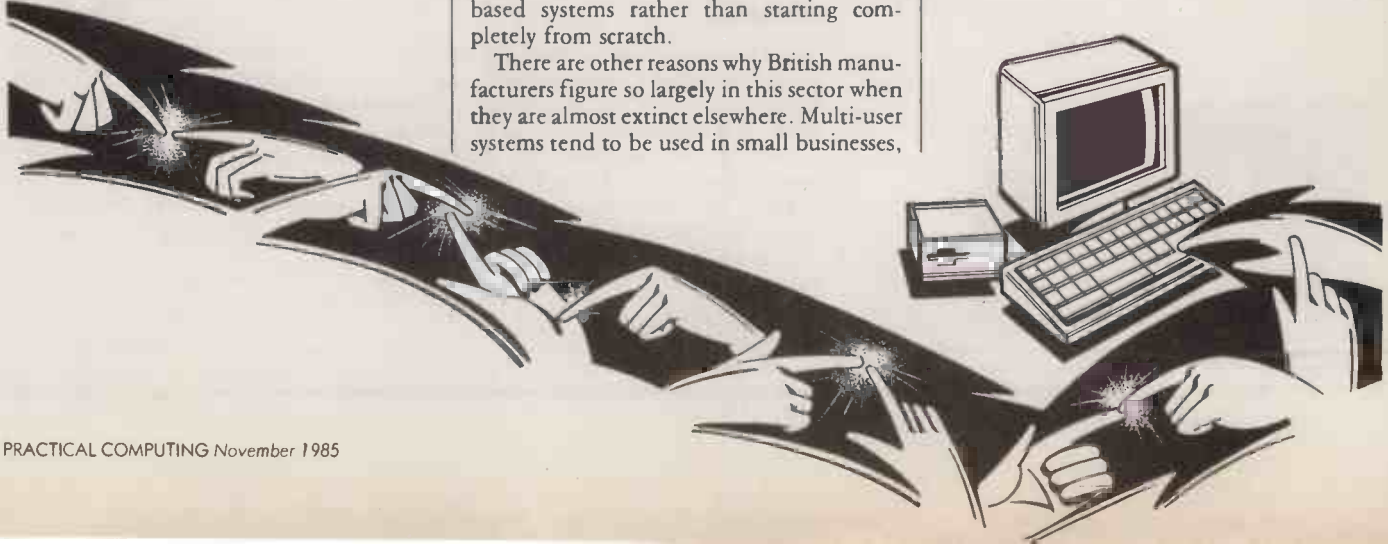
There is also the problem of placing all your micro eggs in one basket. If a multi-user system goes down, it takes everyone with it. At least with the network approach the stand-alone capability remains even if the net malfunctions.

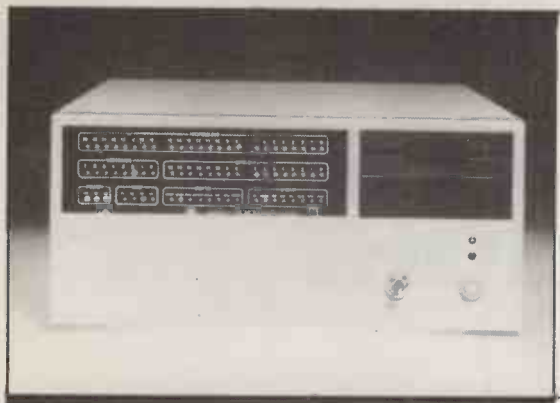
Set against this, there are the advantages of cost and centralisation. For some multi-user systems, adding a user can cost as little as adding a terminal. Multi-user solutions are also neater in terms of organisation. Once you have decided on the system, you can go out and buy it; networks require more work in bringing everyone together.

The systems on the next page give some idea of the range of options available. Prices quoted are rough guides to the cost of minimum workable configurations. Since many of the systems work using broadly the same setups it is difficult to discriminate between them. For this reason anyone thinking of investing in a multi-user system would be well advised to check out some of the alternatives. PC

SUPPLIERS

Accron Fast/Net: Newtons Laboratories, 111-113 Wandsworth High Street, London SW18 4JB. Telephone: 01-874 6511. Circle no. 361.
Alpha Micro 1000: Alpha Micro Great Britain Ltd, Berkshire House, 56 Herschel Street, Slough, Berkshire SL1 1PY. Tel: (0753) 821922. Circle no. 362.
IMP-68: IMP Ltd, Number One Industrial Estate, Medomsley Road, Consett, County Durham DH8 6SY. Tel: (0207) 503481. Circle no. 363.
Midas: Sirton Computer Systems, 7 Greenlea Park, Prince George's Road, London SW19 2PT. Telephone: 01-640 6931. Circle no. 364.
Minstrel: HM Systems Ltd, Minstrel House, 220 The Vale, London NW11 8HZ. Telephone: 01-209 0911. Circle no. 365.
Pinnacle: TDI Pinnacle Ltd, 29 Alma Vale Road, Bristol BS8 2HL. Tel: (0272) 742796. Circle no. 366.
Sprite: Jarogate Ltd, 197-213 Lyham Road, London SW2 5PY. Telephone: 01-671 6321. Circle no. 367.
Superstar: Bromley Computer Consultancy, 417-421 Bromley Road, Bromley, Kent BR1 4PJ. Telephone: 01-461 3993. Circle no. 368.
Ultraframe: Synamics Business Systems Ltd, 78 Buckingham Gate, London SW1 6PD. Tel: 01-222 4701. Circle no. 369.
Vienna AOC: Northern Telecom Data Systems Ltd, Maylands Avenue, Hemel Hempstead, Hertfordshire HP2 7LD. Telephone: (0442) 41141. Circle no. 370.





ACCRON FAST/NET £6,000

The Accron Fast/Net from Newtons Laboratories is something of a hybrid. It uses the S-100 bus, together with a 68000 running under the Mirage operating system, a DEC-derived product. Users can either hook directly into this processor, or up to 16 additional slave boards can be added in the standard way. The boards can be used independently of the main chip and run their own operating system, or they can link up with it to form I/O processors connected to the master processor. Under Mirage, languages such as Basic, Fortran, Pascal and APL can all access the full 16Mbyte address range of the 68000. Slave processors can be Z-80As, Z-80Bs or 8MHz 8088s, with 64K and 1Mbyte RAM respectively. Storage begins at 10Mbyte and goes up to 70Mbyte.

FOR Wide range of multi-user options. Large storage capacity.

AGAINST Non-standard main operating system.

ALPHA MICRO AM-1000 £6,500

The AM-1000 is the entry system for an extensive range of multi-user micros all based on the 68000, costing from £6,500 up to over £70,000. The AM-1000 comes with 128K RAM upgradable to 896K. Storage consists of one or two 800K floppies, and Winchesters from 10Mbyte to 55Mbyte. Three serial ports come as standard, with an optional Centronics port. Up to 11 users can be hooked up at once. There is a Z-80 co-processor option, allowing one of the users to run CP/M. For the rest, the main operating system is Amos, a home-grown concoction from Alpha Micro, based on DEC's RT-11. Some of the models with larger Winchesters can also run Unix V.

FOR Upgrade path.

AGAINST Entry price. Non-standard main operating system.

HM MINSTREL £6,000

Both the well-established Minstrel 2 and the new Minstrel 4 are S-100-based machines running TurboDOS. The latest model uses an 80186 with 1Mbyte RAM as the master processor; the slaves are usually 70116s, Hitachi's close variant of the 80186. Up to 16 users can be accommodated. Storage options start with a 40Mbyte Winchester and move up to the gigabyte range. An Arcnet controller is included as standard on the Winchester board. In addition to two serial and one parallel port on the main board, each user adds an extra serial port. The Minstrel 2 is similar, except that it uses a Z-80B as master processor. The maximum number of users is 12, and Winchester options are currently 20, 40 and 64Mbyte.

FOR Storage expansion.

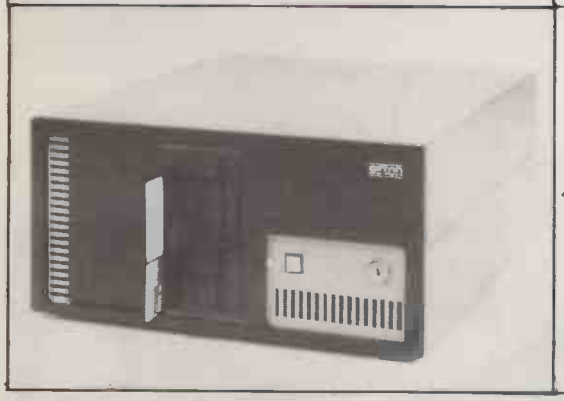
AGAINST Not much.

IMP £7,000

The IMP-68 is both an S-100 and a Unix machine. It runs an 8MHz 68000 processor under either Xenix or Idris. BOS is also available. Unlike the Z-80 based S-100 multi-processor machines, the IMP-68 draws all its processing power from the one main chip. This has the advantage of cost, since all you need to add users is a terminal for the first eight, and then an extra board for a further eight users. The danger is that running several processor-intensive tasks concurrently will result in degradation of response. RAM starts at 256K, and can go up to 4Mbyte. There is a 1Mbyte floppy disc, and a Winchester with 10Mbyte capacity upgradable to 2,400Mbyte. In addition to the IMP-68, there is now a version running the full 68020 processor.

FOR Cheap upgradability.

AGAINST Danger of degradation. No CP/M or MS-DOS facilities.



MIDAS £6,000

Sirton produces a range of multi-user systems, all based on the S-100 bus. The flagship is the Midas 286, which uses an 80286 running under Concurrent CP/M and Xenix. There is also a Z-80 which acts as a controller for the disc drive and handles a 256K RAM cache. Main RAM starts at 512K and can be increased to 6Mbyte. There is a 360K floppy disc, and Winchesters from 20Mbyte to 150Mbyte. The standard system can handle two users, and the maximum is 18. The Midas 68XE uses a 68000 running under Xenix; Idris is also available. The basic system starts with two users, and goes up to about six. Unusually, it has an 8in. floppy together with a 10Mbyte Winchester. Both systems have built-in Ethernet controller chips.

FOR RAM cache on Midas 286. Ethernet controller.

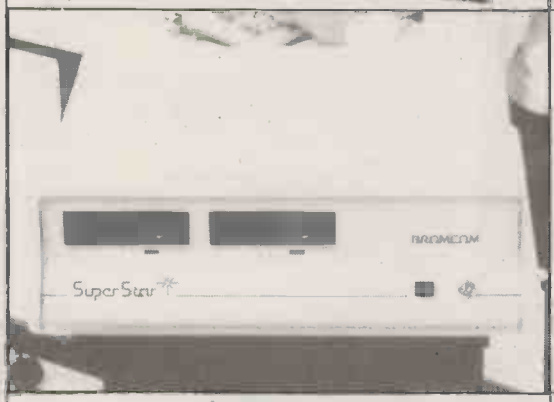
AGAINST Inelegant looks.

SPRITE £6,000

Jarogate's Sprite is one of the new generation of machines running an 80286, the chip found in the IBM PC/AT. But it is based around the S-100 bus, rather than aping the IBM's internal structure too. However, running under Concurrent CP/M, the Jarogate does offer a PC-DOS emulation mode. The basic machine can handle two users; adding two serial boards increases this to 16. RAM begins at 512K and can be increased to 6Mbyte with additional boards. A 790K floppy and 21Mbyte Winchester are standard, as is an Ethernet chip; maximum Winchester capacity is 150Mbyte. Xenix is available as an alternative operating system, and there is a maths co-processor to speed up this already impressively fast machine.

FOR Price. IBM PC compatibility.

AGAINST Concurrent CP/M is wobbly.



SUPERSTAR £2,450

The Bromcom Superstar is one of the legion of S-100 based multi-user micros. It exploits this to offer a system with almost no degradation as more users are added. Each additional user up to a maximum of 16 is accommodated via a board with its own processor, which may be either a Z-80A or an 80186. The memory per user can be up to 128K RAM for eight-bit systems, and up to 1Mbyte for the 16-bit user. Options include 400K floppies, Winchesters from 10Mbyte to 160Mbyte, and a 40Mbyte tape streamer. The standard operating systems are Turbodos and Impos. Others available include CP/M, MP/M, MS-DOS and Xenix. The entry-level system comes with an eight-bit slave processor, one 400K floppy, 10Mbyte Winchester, VDU and keyboard.

FOR Price. No degradation.

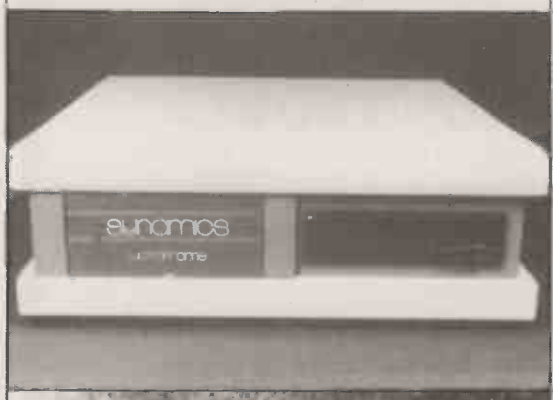
AGAINST Not much.

TDI PINNACLE £6,700

The TDI Pinnacle has a 68000, like several other machines in this survey, but it runs under the UCSD p-System and is designed specifically as a p-System engine. The great benefit of programs written to run under the p-System is their portability. Hence the Pinnacle is in principle less afflicted by the dearth of multi-user software than other machines. Apart from this, the Pinnacle's main recommendation is its tremendous power. Running its 68000 at 12MHz, it produced the fastest Benchmarks we have seen. Winchester options start at 10Mbyte and go up to 32Mbyte. Up to seven users can be accommodated. TDI has recently launched the Pinnacle XL with two 68000s, and able to handle even more concurrent users.

FOR Speed. Portability of software.

AGAINST Obscure nature of p-System.



ULTRAFRAME £9,235

The Ultraframe from Synamics uses multi-processor architecture based around the S-100 bus. It offers a choice of master processor: either the Z-80B or 80186. Slaves can be either Z-80Bs or 8086s, though the latter is only supported by the 80186. Maximum RAM for each slave is respectively 128K and 1Mbyte. There is also a choice of operating systems. As well as the popular Turbodos, which allows up to 18 users, there is p-Net, which can deal with 36 users — two per slave card. It also supports programs running under the p-System. Hard-disc options start at 30Mbyte, and go up to 126Mbyte. There is also a video-tape backup system with a capacity of about 100Mbyte. Each slave board has two serial ports and one parallel port.

FOR Range of processor and operating system options.

AGAINST High entry-level price.

VIENNA AOC £4,000

Like the Jarogate Sprite, Northern Telecom's Vienna AOC uses the 80286 as its main processor. But in addition to offering a multi-user capability under Xenix for up to five users, it claims a full operational compatibility with the IBM PC/AT. In many respects it offers now what the PC/AT will presumably offer in due course: access to the range of IBM software and multi-user capabilities. The Vienna comes with 512K RAM which can be upgraded to 7Mbyte. There is a 1.2Mbyte floppy and an optional 20Mbyte Winchester. The quoted price is for the hard-disc system. Not available at the moment, but due to appear shortly is a very high-quality, high-resolution, white phosphor screen.

FOR IBM compatibility. Excellent screen.

AGAINST Limited multi-user expansion.

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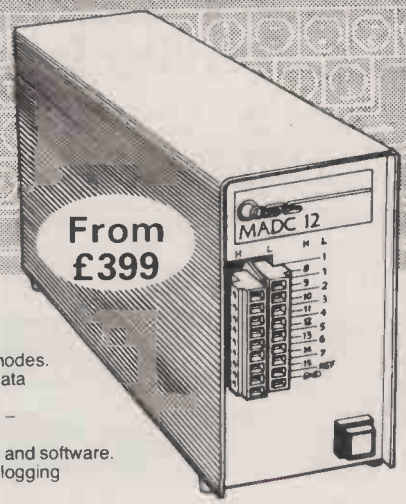

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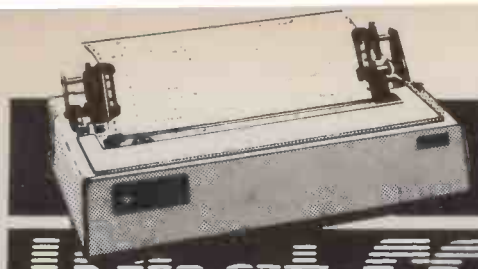

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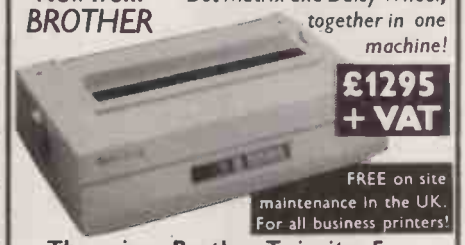

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COMPUTING IN THE FAST LANE

By Ian Stobie

As a contribution to the English language "power user" has little to recommend it. But this American term does have one merit — it brings a very important change in the business software market into sharp focus. While commentators have tended to concentrate on the needs of the first-time user, a glance at the software in the best-seller lists suggests strongly that most of the packages actually sold have been going to a quite different sort of person — the so-called power user.

The typical power user uses his or her computer regularly, for many hours each week, and is in no sense a beginner. These people are not computer programmers, but they are highly computer-literate; at the same time their main professional skill is not in computing but in some other area. Neither are they computer hobbyists — they are not necessarily interested in computers or software as such, just in using them to get things done. They are, in short, a new kind of computer user, created by the micro's triumphant arrival in the office.

WHAT DO THEY DO?

On the next page you can find details of some 40 software products we think are likely to appeal to power users. We also look more closely at three major new power packages: Excel, Microsoft's fleet-footed 1-2-3-like spreadsheet; Rbase 5000, one of the strongest challengers yet for the dBase II crown; and Reflex, an innovative data-analysis package.

For this survey we have accepted the line, put forward by Microsoft among others, that power users naturally divide into three main categories: number-orientated, data-orientated and word-orientated. In our selection we have also included several utilities which will interest power users, and a small number of the most capable all-in-one packages.

The needs of the power user differ radically from those of the beginner or the occasional business user. Speed, extra features and programmability matter for more than superficial user-friendliness. Programmability is a particularly widespread requirement of this sort of user; if you find yourself doing the same task week in, week out it makes sense to set it up as a macro of some kind.

The number-crunching power user wants speed above all, and often plenty of spreadsheet space as well. Macros are well-nigh essential. Integrated graphics to help make sense of the data and enhance the presentation of results to colleagues are also a common requirement.

For the data-orientated power user, programmability is even more important. The same data is often used for instant queries and quite routine tasks like selective mailing, and it makes sense to automate the latter category into simple, quick jobs.

Compared to simple record-keeping systems aimed at less demanding users, power databases offer much greater flexibility in the jobs you can do with the same collection of data. Power users often need to set up complicated file structures to mirror existing real-world systems, and so look for relational-type products which can link two or more files on common key fields.

One sort of power database, as exemplified by Framework, Reflex and Twenty/Twenty, is designed mainly for helping you actively make sense of your data. It then helps you write a suitable report or develop graphical displays for presentation of your results. Such packages will usually integrate graphics, word-processing and statistical functions with a fundamentally data-orientated approach.

Many power users seem prepared to go to the trouble of learning a full-blown database language. This type of package, typified by dBase II, while initially hard for the user, does eventually let you develop business-type applications far more quickly than a traditional programming language like Basic. You also retain much of the flexibility of a programming language to customise things to your exact requirements.

Word processing is an area where the needs of the average user and the power user superficially seem to be not too far removed. But built-in spelling checkers, mail merging and the ability to handle large documents or view several documents at the same time all add to the cost of developing a powerful word processor, and the complexity of controlling it.

Power WP packages themselves seem to have settled down into two contrasting approaches. Multimate is perhaps the foremost example of the traditional secretarial WP: it has powerful boilerplating and mail-merging functions but a rather old-fashioned user interface. At the other extreme is Word, with pop-up menus, multiple type founts and an optional mouse to control it. It in fact has most of the same solid business functions, and it gives you much more control over the appearance of the final document. Apart from brightening up office memos this has the attraction of letting you do more of your printing in-house. Especially when it is connected to a laser printer, you can produce highly acceptable forms, letterheads, invoices and overhead-projector transparencies. Both types of power WP can usually import data from a whole range of other software packages.

ALL-IN-ONE

Few all-in-one packages offer enough functionality in depth in any particular application for the power user, and those that try tend to be cripplingly slow. Given that machine resources on a micro are limited, it is very difficult to achieve all-round success with five or six applications in one package. But most power packages are integrated to a more limited extent: for example, almost all power spreadsheets also draw graphs, and many include a simple database facility. But almost always one task stands out as the pre-eminent purpose of the package.

Power users are naturally attracted to utilities in a big way — generally not the same sort of utilities that programmers like, but more end-user orientated ones. These utilities do things like letting you print big spreadsheets out sideways on your printer, add keyboard macros to packages which lack them, and put phone numbers and your own notes up on the screen while you are in the middle of some other job.

WHAT THEY DO

Deciding between specialised or all-in-one software is not enough — many power packages are optimised for a particular kind of user.

NUMBERS ORIENTATED

Excel
Runs on: Mac
Price: £399
Supplier: Microsoft
Fast, very powerful spreadsheet with easy-to-use macros, good graphics and straightforward database. Newest challenger to Lotus 1-2-3. Will soon run on IBM. Reviewed this issue, page 128.

Logistix
Runs on: IBM, MS-DOS
Price: £395
Supplier: Grafox
Spreadsheet, graphics, database combination like Lotus 1-2-3, but with time management added as an extra function. All functions well integrated.

Lotus 1-2-3
Runs on: IBM, MS-DOS
Price: £430
Supplier: Lotus
Powerful spreadsheet with excellent graphics and macro facilities, simple database and good on-line help. Probably the best-selling business package for the last two yeors.

Multiplan
Runs on: IBM, MS-DOS, Mac, Apple II, CP/M-80
Price: £190
Supplier: Microsoft
Versatile spreadsheet with good business features; lacks graphics and macros. Wide availability on different machines. Easy to learn. Reviewed September 1983.

Options
Runs on: IBM, MS-DOS
Price: £145
Supplier: Sagesoft
Innovative spreadsheet which lets you enter a range of values, and then works out the probability of different results. Reviewed June 1985.

Supercalc 3
Runs on: IBM, MS-DOS
Price: £295
Supplier: Sorcim
Fast spreadsheet with well-integrated graphics and simple database. Spreadsheet size limited, but powerful business functions.

DATA ORIENTATED

Dataflex
Runs on: IBM, MS-DOS, CP/M-80
Price: £995
Supplier: Dataflex
Database aimed at application developers. Provides the fast indexed sequential access method (ISAM), multiple file handling and menu-driven environment for the end-user.

dBase III
Runs on: IBM
Price: £550
Supplier: Ashton-Tate
dBase III is the updated IBM version of dBase II, easily the top-selling database for writing applications. Really a programming language. Reviewed November 1984.

DMS Delta 4
Runs on: IBM, MS-DOS
Price: £495
Supplier: Compsoft
Database and report generator intended for general office administration, mailing, etc. Good for handling data with large number of transactions. Built-in letter writer.

Framework
Runs on: IBM
Price: £550
Supplier: Ashton-Tate
Innovative database with spreadsheet, graphics and WP built in. Fast. Designed for interactive analysis and report writing. Thoroughly programmable. Reviewed February 1985.

Helix
Runs on: Mac
Price: £246
Suppliers: P & P, Softsel, First
Database for report generation and interactive queries. Makes heavy use of Mac's visual interface: icons replace conventional database command language. Reviewed June 1985.

Maclion
Runs on: Mac
Price: £379
Suppliers: P & P, First
Database designed for creating complete business applications. Can handle multiple files, generate reports and transfer data to other Mac applications. Rather complex to use.

Omnis III
Runs on: Mac
Price: £445
Supplier: Blyth
Applications generator, like dBase II, but for Mac windows/mouse environment. Comes with several example applications to start you off.

Rbase 5000
Runs on: IBM
Price: £595
Suppliers: P & P, Softsel, First
Database language of the dBase II type, primarily intended for generating applications. Newer, and some think better, than dBase, but less well known. Reviewed this issue, page 124.

Reflex
Runs on: IBM
Price: £423
Supplier: Softsel
Database with tightly integrated graphics, primarily aimed at people actively analysing data. Excellent for producing reports, graphs and summaries. Reviewed this issue, page 124.

Sycero
Runs on: IBM
Price: £595
Supplier: System C
Program generator. Alternative approach to using a database package for developing data-intensive business applications; produces a Basic program. Reviewed January 1985.

Twenty/Twenty
Runs on: IBM
Price: £345
Supplier: ISPL
Query system and report generator designed to extract data from incompatible programs like Lotus, Multiplan and dBase II. Will not let you alter data.

WORD ORIENTATED

Multimate
Runs on: IBM
Price: £450
Suppliers: P & P, Softsel, First
Word processor with powerful mail-merge and boilerplating facilities. Adopts style of dedicated Wang WP machines. Accepts files from 1-2-3 and dBase.

Perfect Writer II
Runs on: IBM, MS-DOS
Price: £149
Supplier: Thorn EMI
Word processor with built-in thesaurus and separate spelling checker. Lets you view two parts of same file and keep several files active. Good boilerplating. Reviewed June 1985.

Samna Word III
Runs on: IBM
Price: £470
Supplier: Softsel
Full-featured office-style word processor with good mail merging. Can cope with mathematical and foreign-language special characters. Reviewed October 1985.

Silicon Office
Runs on: IBM, MS-DOS
Price: £790
Supplier: Bristol Software Factory
Word processor with integrated database. Good for office administration and selective mailing. Programmable to do routine jobs. Old, but still works. Too expensive.

Volkswriter deluxe
Runs on: IBM
Price: £289
Suppliers: P & P, Softsel, First
Relatively simple-to-use word processor with good mail merging. Supports mathematical and foreign-language characters.

Word
Runs on: IBM, Mac
Price: £400
Supplier: Microsoft
Trailblazing word processor with built-in spelling checker, good mail merging and the ability to display multiple founts. Even the IBM version has a Mac-like interface, and will work with optional mouse. Reviewed September 1985.

Word Perfect 4.0
Runs on: IBM, MS-DOS
Price: £425
Supplier: Sentinel Software
Word processor with built-in mail merge, indexing and spelling checker. Better for those who actually do their own writing than the office-style WP aimed mainly at secretaries. Reviewed August 1985.

WordStar 2000
Runs on: IBM
Price: £440
Supplier: Micropro
Office-style word processor with built-in mail merge and spelling checker. Has different command set and file structure to original WordStar, which many still prefer. Reviewed April 1985.

ALL-IN-ONE

Jazz
Runs on: Mac
Price: £495
Supplier: Lotus
Five functions in one: excellent spreadsheet, plus word processor, graphics, database and comms. Good for picturesque reports — word processor can incorporate graphs and data. Reviewed September 1985.

Open Access
Runs on: IBM, MS-DOS
Price: £450
Supplier: SPI
Six in one. Excellent database, nice graphics, plus spreadsheet, word processor, comms and time management. All six up to scratch. Good for handling lots of data, but not for beginners. Reviewed September 1984.

Symphony
Runs on: IBM
Price: £595
Supplier: Lotus
Spreadsheet, database, graphics, word processor and comms. An ace spreadsheet, but the package is memory-hungry. Many users prefer Lotus's less ambitious 1-2-3. Reviewed February 1985.

UTILITIES

Chip-Chat
Runs on: IBM, MS-DOS
Price: £130
Supplier: Sagesoft
Comms program. Comes set up for the most popular U.K. electronic mail and bulletin-board services. Also available with autodial modem for an extra £269. To be reviewed shortly.

Copy II
Runs on: IBM, Apple II, Mac
Price: £39.95
Supplier: P & P
Bit copier. Lets you make backup copies of most copy-protected business software. Mac version includes many of the standard housekeeping functions found in a conventional DOS.

Crosstalk
Runs on: IBM, MS-DOS, Apple II, CP/M-80
Price: £169
Suppliers: P & P, Softsel, First
Comms program. Lets you get programs and data to and from other computer systems, either down a cable or through the telephone system via a modem. Very flexible.

dBcompiler
Runs on: IBM, MS-DOS
Price: £650
Supplier: P & P
Compiler which lets you convert dBase II applications into directly executable form which then runs independently. Main advantage is speed. Reviewed April 1985.

Norton Utilities
Runs on: IBM
Price: £89
Suppliers: P & P, Softsel, First
Set of mainly disc utilities. Recovers data from damaged discs, restores accidentally erased files, browses through the raw data, and so on.

Prokey
Runs on: IBM
Price: £114
Suppliers: P & P, Softsel, First
Keyboard enhancer. Lets you set up hundreds of keystrokes as single-key macros. Works with most application programs, and on both data and commands.

Sidekick
Runs on: IBM
Price: £47
Suppliers: P & P, Softsel, First
Desk accessory which runs at the some time as your main application, popping up on demand to provide on-screen notepad, calculator, calendar and other useful functions. Surprise best-seller.

Sideways
Runs on: IBM, Apple II
Price: £53
Suppliers: P & P, Softsel, First
Printing utility which lets you print spreadsheets, etc. sideways down the length of the paper rather than across it.

Superkey
Runs on: IBM
Price: £60
Suppliers: P & P, Softsel, First
Keyboard enhancer like Prokey, but with extras and therefore more memory-hungry. Lets you encrypt any file on your disc, and will work alongside Sidekick.

Spotlight
Runs on: IBM
Price: £103
Suppliers: P & P, Softsel, First
Desk-top organiser. Contains six accessories: notepad, calculator, phone book, card box appointments, DOS aid. More powerful than Sidekick, but not as quick.

Switcher
Runs on: Mac
Price: £20
Supplier: Apple
System utility for 512K Mac which lets you hold two or three programs in memory, and switch instantly between them. Greatly speeds up data transfer between applications.

VCN Execuvision
Runs on: IBM
Price: £343
Supplier: P & P
Picture processor which lets you create charts or import them from other packages, then enhance them with images from a built-in library.

SUPPLIERS

Apple Computer (U.K.) Eastman Way, Hemel Hempstead, Hertfordshire HP2 7HQ. Telephone: (0442) 60244.
Ashton-Tate (U.K.) Oaklands, 1 Bath Road, Maidenhead, Berkshire SL6 4UH. Telephone: (0628) 33123.
Blyth Software Mitford House, Benhall, Saxmundham, Suffolk IP17 1JS. Telephone: (0728) 3011.
Bristol Software Factory Thornton House, Richmond Hill, Clifton, Bristol BS8 1AT. Telephone: (0272) 735022.
Compsoft Compsoft Manor, Farncombe Hill, Godalming, Surrey GU7 2AR. Telephone: (04868) 25925.
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First Software Intec 1, Wade Road, Basingstoke, Hampsire RG24 0NE. Telephone: (0256) 463344.
Grafox 65 Banbury Road, Oxford OX2 6PE. Telephone: (0865) 516281.
Interactive Software Products 1-4 Lloyds Bank Chambers, The Maltings, St. Albans, Hertfordshire. Telephone: (0727) 36341.
Lotus Development (U.K.) Consort House, Victoria Street, Windsor, Berkshire SL4 1EX. Telephone: (0753) 840281.
Micropro International Haygarth House, 28-31 High Street, London SW19 5BY. Telephone: 01-879 1122.
Microsoft Excel House, 49 De Montfort Rood, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741.
P & P Micro Distributors Todd Hall Road, Carrs Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5HU. Telephone: (0706) 217744.
Sagesoft HEI House, Regent Centre, Gosforth, Newcastle upon Tyne NE3 3DS. Telephone: 091-284 7077.
Sentinel Software Wellington House, New Zealand Avenue, Walton-on-Thames, Surrey KT12 1PY. Telephone: (0932) 231164.
Softsel Computer Products Softsel House, Syon Gateway, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866.
Software Products International (SPI) 13 Horseshoe Park Estate, Pangbourne, Berkshire RG8 7JN. Telephone: (07357) 4081.
Sorcim-IUS Micro Software 16-20 High Street, Maidenhead, Berkshire SL6 1QH. Telephone: (0628) 70911.
System C 7 Mill Street, Moidstone, Kent ME15 6XW. Telephone: (0622) 55142.
Thorn EMI Computer Software Thomson House, 296 Farnborough Road, Farnborough, Hampshire GU14 7NF. Telephone: (0252) 543333.

SUPER-DATABASES

Mike Lewis tests a ready-made analysis tool and a powerful, specialised programming language — two programs which exemplify different approaches to database software.

Both Analytica's Reflex and Microrim's Rbase 5000 are impressive products. While they have their limitations and weaknesses, they provide a very powerful set of tools for the user who does not mind going to some trouble to master them. At heart both are databases, although they differ enormously in the facilities they offer.

Of the two, Reflex is by far the easier to use. The first thing you notice when you start it up is a certain similarity to the much-praised Macintosh user interface. You will find pull-down menus, mouse support, and a limited form of overlapping windows — although these are less manoeuvrable than the Mac variety. But don't worry if you have no mouse, as the package works just as well without.

Another good feature is that typing can be kept to an absolute minimum. Whenever you need to specify a field name or an option, you press a function key to see a list of the possibilities, then use the mouse or cursor keys to point to the one you want. The only tasks where large-scale typing is unavoidable are data entry and the initial design of a form.

In Reflex, designing a form is equivalent to specifying the database structure. You do this by painting the form on the screen, which has a notional size of 500 by 500 characters. Unusually, field names can consist of several words or even entire sentences. The fields themselves do not have to be a fixed length, and you can even get away with not giving them a type.

DATA ENTRY

Entering data is straightforward. All the usual cursor-control and editing options are available, and you can step forwards or backwards through the forms and make changes at will. What makes Reflex unusual is the concept of Views. This is in contrast to integrated packages like Framework and Open Access, which have different modules for database, spreadsheet, word processing, etc., and derive their strength from their ability to transport data between the modules quickly and easily.

In Reflex, there is a single database module, but you have the opportunity to look at the data in any of five different ways. When you are working with your forms, you are in Form View. A quick selection from a pull-down menu will put you in List View. Here the data appears in a grid, with one row for each record and a column per field. This looks like a spreadsheet, complete with adjustable column widths and various precision and format options.

The point is that both List View and Form View work with the same data. It is merely the way in which you look at it which is different. If you alter the contents of a List View cell, the corresponding form is also altered. You can see this in action by splitting the screen to show both Views at once. If you page through your pile of forms, you see the list scroll in harmony.

An interesting feature of List View is the way in which you can rearrange, insert and delete columns. Doing this only affects the View, not the actual data. So if you just want to see the names and phone numbers of your customers, you can hide all the other details. For example, if you move the cursor to a column heading and enter a different field name, the entire column is immediately replaced with the contents of the new field.

FILTERING

What works for columns also works, though slightly differently, for rows. Reflex allows you to apply a filter condition to the database, the effect being to hide all records which do not meet the condition. For example, you could filter out all customers who are not in England. Scottish and Welsh clients remain in the file, but they are disregarded by Reflex for as long as the filter is in force.

By combining filters, column manipulation and the ability to sort the database, you can use the List View as a simple report generator. For any reasonably sophisticated reports you have to turn to the separate Report View, which is a lot harder to use.

As in a real spreadsheet, you can enter formulae into List View cells, or for that matter into fields in a form. Reflex provides 42 built-in functions, including mathematical, financial — like future value of an annuity — and logical, such as If-Then-Else. As in most spreadsheets, you can specify that the formulae are to be evaluated immediately or you can defer this to later.

What you cannot do is include values from other records in a formula. This is a major limitation because it means that you cannot, for example, add up all the values in one column and put the result in another. A formula can only work horizontally. There are plenty of ways round this in some of the other Views, but none of these has quite the simplicity and ease of use of the List View.

The third of Reflex's Views is for drawing graphs. This offers the usual unadventurous histograms and pie charts, and the pictures themselves are nothing of note. What makes the Graph View interesting is the way in which you can build a graph dynamically, watching it appear on the screen as you specify the variables to be plotted and the type of chart you want.

Furthermore, since the graph is just another View of the underlying data, selecting a point on it is the same action as finding a record. So if you want to know why your November sales figures are so low, you can move the cursor to the appropriate point, then open a Forms View window and expect to see the relevant sales record.

Graph View works best if your database is made up of transactions rather than master records. For example, if your business has salespeople, customers and products, your Reflex forms would ideally be details of individual sales, showing date, amount, salesperson's initials, customer number and product code. That way you could plot, say, total sales per product per customer, or average sales per salesperson per month. It is this kind of analysis that Reflex is best at.

This is especially true of the fourth View, the Crosstab View, which produces a two-dimensional analysis of any numeric value. Like the Graph View, you can build it up and alter its parameters while the View is on-screen. It is the work of a moment to switch the View of the figures of sales per salesperson per month from, say, total value to average value to number of transactions.

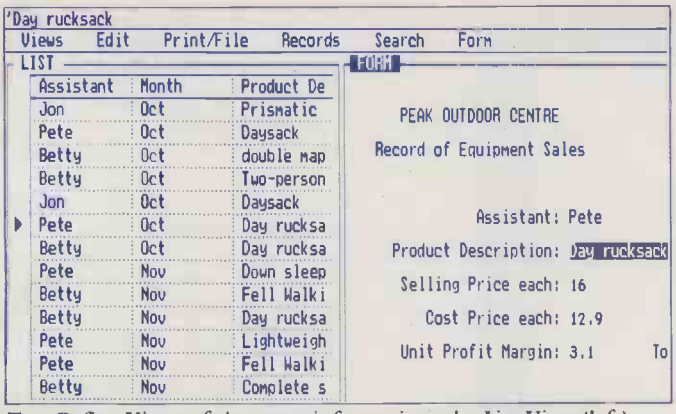
REPORT VIEW

The final View, Report View, is the most powerful but also the most complicated. You can use it to produce virtually any kind of report, and you have considerable flexibility in specifying headings, detail lines, control breaks, sub-totals, action on page breaks, and much more. But a complex report inevitably takes a long time to set up and careful planning is vital.

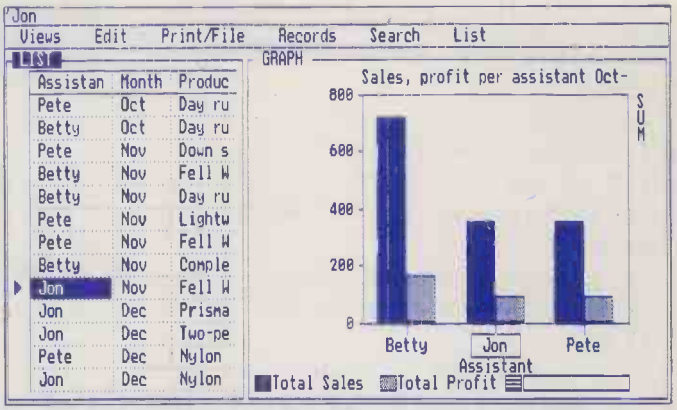
In spite of its power, Reflex has its drawbacks. Chief of these is that it is a flat-file system. For all its impressive ways of viewing data, you cannot look at more than one file at a time. A report showing sales per

REFLEX

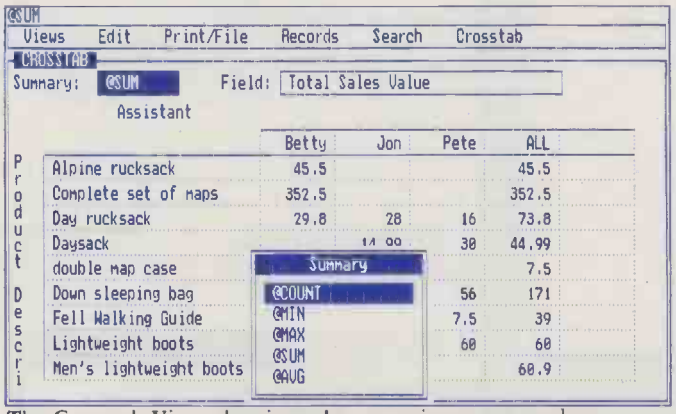
Description: database with features for graphics, report production, numerical analysis and spreadsheet-style work
Hardware required: IBM PC family or compatible with 384K RAM, IBM colour/graphics adaptor or Hercules graphics card, optional colour display, and hard disc or two floppy discs; optional mouse
Publisher: Anolytica Corporation
Price: £422.65 plus VAT
U.K. distributor: Softsel Computer Products Ltd, Softsel House, Syon Gateway, Great West Road, Brentford, Middlesex TW8 9DD. Telephone 01-568 8866
Available: now



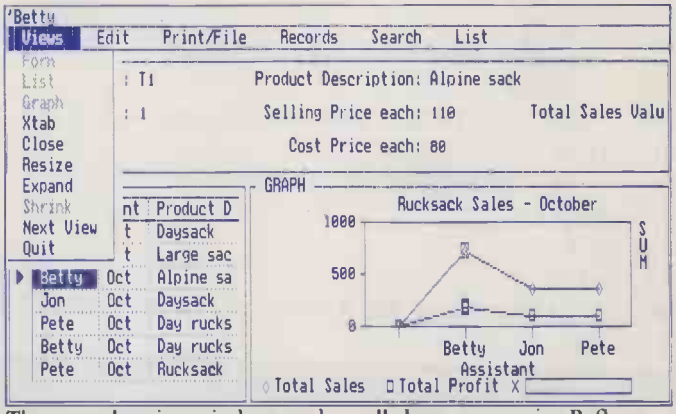
Two Reflex Views of the same information: the List View (left) and the Form View. Data may be entered in either.



Altering data in the List View causes the graph to be updated straight away.



The Cross-tab View, showing sales per assistant per product. Changing the Summary operator from @Sum to @Count will alter the View to show the number of transactions rather than their total value.



Three overlapping windows and a pull-down menu give Reflex a Macintosh-like appearance.

REFLEX

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	☐	☐	■
Documentation	☐	☐	■	☐
Value for money	☐	☐	■	☐

A powerful package that is also easy to use. The concept of multiple Views works well.

customer could not also show the customers' addresses, unless this information was expensively duplicated in all the sales transaction records.

Another weakness is that Reflex does not readily lend itself to turnkey applications. If your role as a power user is to set up systems which other staff members can use unaided, Reflex is not ideal. It is true that the trickier tasks, like report and cross-tab specifications, can be saved to disc and used later by somebody not familiar with the technicalities involved. But they would still have to learn how to operate Reflex itself, rather than just concentrate on a menu-driven application.

Neither of these drawbacks applies to Rbase 5000. Rbase is a high-level programming language designed specifically for building turnkey systems. As with most interpreters, it can be used in two ways. You can type a command at a prompt, which in this case is R>, and see it executed at once, or you can store a sequence of commands in a file for later use.

Inevitably, Rbase invites comparison with Ashton-Tate's dBase family, with which it has much in common. Of the two, Rbase is certainly the more powerful, but people may prefer to stay with what they know; it has simply arrived too late to overtake the market leader.

A good example of its greater power is the Select command. This allows you to list named fields for selected records, with options for specifying the widths of individual fields, the sequence of the output and totals of specified columns. The same result is easy to obtain in dBase III but you would need at least three commands to do it.

ABSTRACT RELATIONSHIPS

In Rbase "fields" are columns, "records" are rows and "files" are tables. A database is a collection of tables which are all related in some way. This is not just a question of semantics. Rbase is designed to help you think in terms of relationships without being distracted by the way in which data is physically stored in files.

In fact, Rbase is the nearest thing I have seen to a true relational database on a micro.

RBASE 5000

Description: high-level programming language for relational database applications, with application generator, text editor, compiler and file-conversion software
Hardware required: IBM PC family or compatible, with 256K RAM — 320K recommended — and hard disc or two floppy discs — hard disc recommended
Publisher: Microrim Inc.
Price: £595 plus VAT
U.K. supplier: P&P Micro Distributors Ltd, Todd Hall Road, Carrs Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5HU. Telephone: (0706) 217744
Available: now

It supports the formal relational operators, project, append, union, intersect, subtract and join, which together provide a very sophisticated set of tools for manipulating data. It is a pity that they are so badly explained in the manual.

Another example of the language's power is the use of rules. These are validation tests which you can tie into the database, along with the field widths and data types. They can be made up of compound conditions, not just the character masks found in dBase's Picture clause, and you can specify an error message for when the test fails. Assigning the rules to the data rather than

(continued on next page)

```
NEWPAGE
DRAW ORDER WITH ALL AT 1
SET VARIABLE ok TO "NO"
WHILE ok EQ "NO" THEN
  EDIT VARIABLE adjust amount
  WRITE "                              " AT 24 1
  IF adjust FAILS OR amount FAILS OR amount EQ 0 THEN
    WRITE "Must be entered" AT 24 1
  ELSE
    IF amount LT 0 THEN
      SET VARIABLE amount TO .amount X -1
      IF amount GT .stock THEN
        WRITE "Insufficient stock" AT 24 1
      ELSE
        SET VARIABLE ok TO "YES"
      ENDIF
      SET VARIABLE amount TO .amount X -1
    ELSE
      SET VARIABLE ok TO "YES"
    ENDIF
  ENDIF
ENDWHILE
WRITE "Returning to menu.  Please wait..."
RETURN
```

The Rbase language contains around 80 commands, with several hundred combinations of sub-commands and clauses. In this program fragment, the Draw statement displays the outline of a form, while Edit puts the system into data-entry mode. Rbase is fully structured. It supports nested If-Else-Endif and While-Endwhile, as shown here, as well as a Case statement and subroutine calling with parameters.

(continued from previous page)

writing them in command files is good because they can be changed independently of the procedures that use them.

As an antidote to the complexities of the package, Rbase provides extensive on-screen assistance. For example, there is Help mode, in which the R> prompt is replaced by H>. Here, typing a command brings up a screenful of explanatory information. Prompt mode is signalled by P>, and occurs when you have to enter the first word of a command. At this point Rbase starts asking you questions about what you want to do and builds the command for you. This is very similar to the dBase command assistant.

Another of these modes, Define, is used to specify the structure of a database. It is surprisingly clumsy. First you execute the Define command, which brings up a D> prompt. Then you list all the columns for all the tables in the database, giving them a width and type. Finally, you type the column names again, this time grouped by table. You must type them in the right order, and if you make a mistake you have to use a different set of commands to alter them.

Setting up data-entry forms is also a long-winded process. However, you do have considerable freedom in how the form will look. In Reflex, the field's name must always appear on the form, and the user has no control in the placing of the field in relation to the name. No such restrictions apply in Rbase, but setting up the Rbase form is a three-stage process, compared to the simple screen-painting of Reflex.

The same is true of reports. The Rbase report generator requires even more effort than that of Reflex, but is more sophisticated. The difficulty of combining customer addresses with sales data would certainly not exist with Rbase. The ability to store up to 1,500 characters of text in a field, coupled with a paragraph reforming capability, opens the door to all sorts of mailmerge and WP applications.

APPLICATION GENERATOR

In case any of its customers are overwhelmed by all this power, Microrim has provided another way of using Rbase in the form of an alternative front end called Express. It is intended for people who do not want to get involved with the Rbase language and aims to build an application for you by taking you through a series of questions and answers. The end product is an ordinary command file, which you run from the R> prompt in the usual way.

Applications generated by Express are themselves menu-driven, with the user — that is, the application builder — designing the menus and optionally a set of help screens to go with them. Inevitably, the applications are limited to relatively simple tasks like entering, editing and listing data. Even these take a long time to set up and you are required to provide answers to a seemingly endless list of questions. In fact, Express has very little to recommend it to the power user.

Other Rbase features include an editor for command files and a compiler. The editor is rudimentary, lacking such functions as cursor movement by word, string searching, cut and paste, etc. Fortunately you can use any ASCII editor or WP program to set up command files. The compiler is not really a compiler but a utility for converting a command file to a tokenised form, which is executed from the R> prompt in the normal way. This is supposed to run faster than an ordinary file.

For any product with the sophistication of Rbase, good documentation is essential. Unfortunately, the Rbase manual leaves a lot to be desired. It lacks an overview of the whole package, and in the introductory chapters it fails to distinguish the Rbase language from Express, which is after all aimed at a different type of user. On the other hand, the Reflex manual is clearly written and well organised.

RBASE 5000

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	■	☐	☐
Documentation	☐	■	☐	☐
Value for money	☐	☐	■	☐

A superior database language that will appeal to the ambitious system builder.

CONCLUSIONS

- Reflex is a superb tool for producing an endless variety of ad hoc reports, summaries and graphs from a single set of data. It is less suitable for tasks such as updating master files from transaction details or setting up complex spreadsheet models.
- Being essentially a programming language, Rbase 5000 has far more capability than Reflex but, inevitably, more effort is needed to use it.
- Once you have mastered Rbase, you will be able to use it for setting up menu-driven applications to be used by less experienced staff.
- With Reflex there is no way of hiding the package from people who are only concerned with the application.
- Reflex should prove an easy program to learn. It has an admirably logical and consistent user interface, and the manual is very readable.
- With Rbase, interaction is via a command line, which is of necessity more difficult. The alternative user-friendly front end, Express, does not really succeed.
- Rbase is certainly better than its rivals, dBase II and dBase III, but probably not so much better that it is worth switching.

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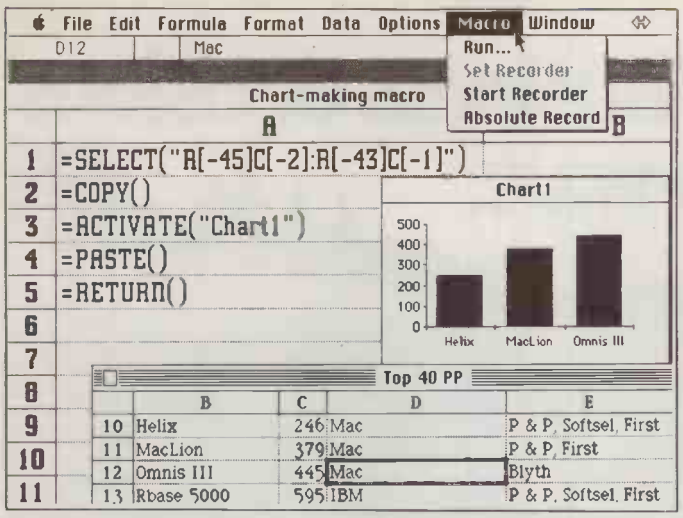
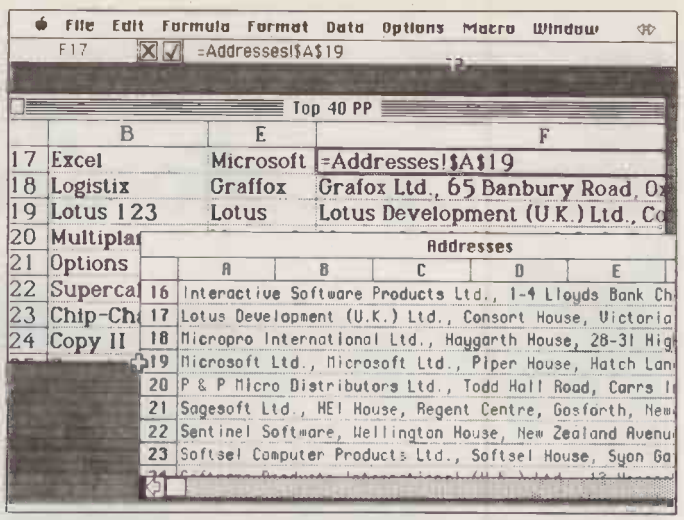


Excel lets you create a macro simply by recording the commands you give as you perform a particular task. You can do the task again just by selecting the appropriate macro.



Excel allows you to use data contained in one worksheet in another. Here address information is automatically copied across merely by referencing it.

SUPER-SPREADSHEET

As the top-selling business program for over two years, Lotus 1-2-3 makes a tempting target for competitors. Ian Stobie looks at Microsoft's Excel, perhaps its strongest challenger yet in the power spreadsheet stakes.

Microsoft Excel is designed as a direct challenge to Lotus 1-2-3, currently the top business spreadsheet. Like 1-2-3, Excel is an integrated spreadsheet, with built-in business graphics and a powerful macro facility. Unlike 1-2-3 it runs on the Macintosh.

Excel will cost £395 in the Mac version, and requires the larger 512K machine to run. Microsoft is also developing an IBM version of Excel, scheduled for completion next year. This review is based on the beta-test version of the Mac product, which we have been using for the last few weeks. The finalised Mac version should be going on sale in the U.K. about now.

Power users tend to be interested in a feature-packed specification, good performance, and programmability. Microsoft already does one highly rated spreadsheet, Multiplan, but this lacks graphics and macros and so is not a straight competitor to Lotus 1-2-3, which has both. The forthcoming 1.4 release of Multiplan will reportedly have macros, but it will still be positioned below Excel, the real power offering in Microsoft's range. For certain users Multiplan still retains some advantages: for example, it runs on smaller machines, such as the 128K Mac.

Excel looks pretty much like Mac Multiplan when you first get it running. This is no accident, as the user interface has been made deliberately similar to encourage Multiplan users to upgrade. In Excel you have the choice of numbering your worksheets Multiplan fashion, with the top-left cell designated R1C1, or Lotus fashion as A1. The only other obvious difference is that Excel worksheets are bigger than both 1-2-3 and Multiplan — 256 columns by 16,384 rows, or over four million cells, which is a bit ridiculous given the amount of memory available on present-day machines.

Excel generally makes the most of the Macintosh interface. You can have windows open into several different worksheets at a time, or have several windows into different places in the same worksheet. Column widths are easily changed and you can select a row or column and highlight it in italic or bold script. Fount size and style is also adjustable; only one typeface and size — say 10pt Geneva or 12pt Athens — is allowed within a single worksheet, but normal italic and bold styles can be varied at the level of column or row.

PRESENTATION TOOL

This highlights an important difference from Multiplan. While Multiplan is just a spreadsheet Excel is, like 1-2-3, also a presentation tool. The Excel user is the sort of person who may often need to put figures on to paper, and Excel is designed to make them look convincing.

Charting facilities are comprehensive. Excel has seven different chart types, with a total of 42 different variations. Among the more unusual possibilities are charts with logarithmic scales. Excel's charting is well integrated with the spreadsheet. We found creating a chart quicker than with Lotus's Jazz package, which we ran on the Mac for comparison. Once you have drawn a chart in one form, trying out different variations until the data looks right is also very easy.

Excel's database function is also best seen as an adjunct to the presentation role of the package. It is not meant to be particularly powerful, and you are limited to the number of records that will fit in a worksheet. You can designate any part of your worksheet as a database, and the rows can then be treated as records for sorting or searching. You can put extracted records into a separate part of your worksheet or into a new document. This part of Excel is simple but well implemented.

Power users will very probably want to transfer data to and from other applications, and this is where Switcher comes in. Switcher is an Apple operating-system extension which lets you run more than one application program at a time; Microsoft is supplying it included in the price of Excel. With both Switcher and Excel in memory there is room for one other 128K application on the 512K Mac — for example, Macwrite or Microsoft Word.

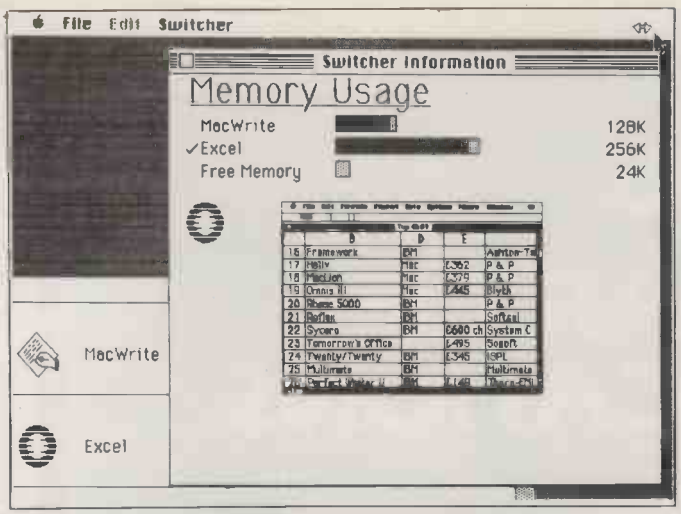
With Switcher in memory you carry on using your computer normally. A small double arrowhead is displayed on the screen

EXCEL

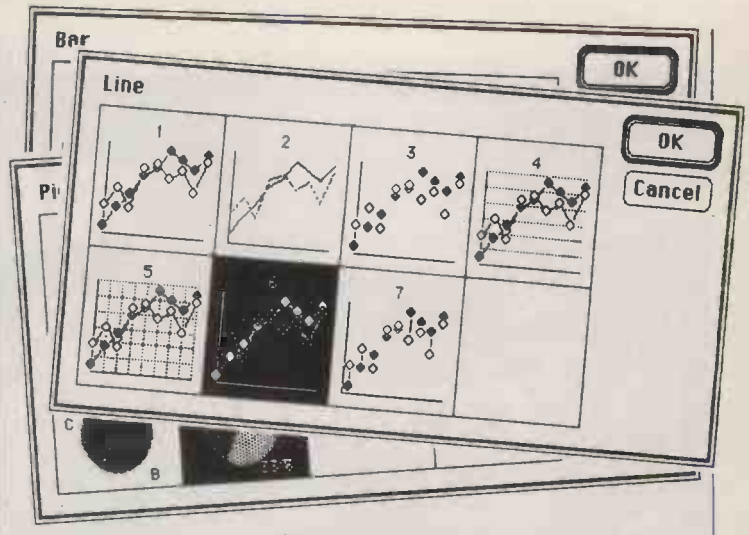
PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	☐	■
Ease of use	☐	☐	■	☐
Documentation	☐	☐	■	☐
Value for money	☐	☐	■	☐

☐ A better super-spreadsheet than anything else running on the Mac; should be a strong competitor for 1-2-3 when the IBM version comes out.



With Switcher you can get Macwrite into memory at the same time as Excel. This helps you copy data between them.



Excel offers a total of 42 different chart types in seven categories — the full set offered by Microsoft Chart.

SPECIFICATION

Description: integrated spreadsheet, business graphics and simple database for number-orientated business.
Runs on: 512K Mac; IBM version expected next year
Spreadsheet: 16,384 row by 256 column, supports multiple worksheets, references across worksheets, macros
Graphics: seven major types with 42 variations
Database: sorts on up to three sort fields and extracts; record numbers limited by size of worksheet
Data transfer: supports Sylk, Lotus and standard Mac formats; supplied with Switcher to link to other Mac software
Publisher: Microsoft Corp. of Bellevue, Washington, U.S.A.
Price: £395 plus VAT, includes Apple Switcher; price to registered Multiplan and Chart users is £100
Supplier: Microsoft Ltd, Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP; telephone (0734) 500741; available September in U.S., "soon after" in U.K.

at the top right-hand corner, and when you point at it with the mouse, you switch to your other application instantly. Switcher preserves the current status of your original application, so when you later switch back you can take up at exactly the same point you left off.

This is obviously a big advantage if you want to do two things at the same time. While writing this review, for instance, I have frequently been switching between Excel and Macwrite. Where Switcher really comes into its own is when you want to transfer data between two applications: you can load up the clipboard with text or graphic data in one application, and then use it in another. We successfully used this technique in both directions between Excel and Macwrite.

Excel is also able to read existing files in several common formats without using Switcher. Here you just open the complete file as a new worksheet and Excel loads the data in. We tried this with both Jazz and Macwrite files. Some formatting information was lost, but the basic data came across.

Things did sometimes slow down noticeably when we had Switcher, Excel and another application resident in memory. We had beta-test versions of both Switcher and Excel, and no documentation for Switcher, so this may well turn out to be less of a problem in the final product. But even under these conditions we found the Excel/Macwrite combination performed better than the finished release 1 of Jazz, particularly when word processing large documents.

SPEED FOR POWER USERS

Because Excel is aimed at power users, the question of speed is important. Microsoft claims Excel will be very fast and says that all sorts of unusual coding methods have been used to achieve this. Unfortunately it is hard to judge from an non-optimised beta-test copy with test code still in it. Just using Excel, without Switcher, our version sorted a large model quite quickly, but in general we did not get an impression of either startling speed or annoying slowness.

Power users are also often interested in the ability to link worksheets. For example, you might want to take totals from several separate monthly or regional worksheets, and consolidate them into an annual or national sheet. Excel seems ideal for this sort of thing. It lets you address cells in another worksheet or even on another disc; Excel will prompt you with the disc name when it encounters a reference.

You can set up these external references in either of two ways. If you can remember the cell numbers you merely type them into your formula with the worksheet name in front of them. Alternatively you can open the second worksheet in a new window and just click on cells as you want them.

Macros are extremely useful to the power user, who repeatedly uses a package for the same task. Excel adopts an excellent approach. Instead of having to learn a whole command language to create macros, you simply select Start Record from a pull-down menu; you then carry out your task as normal. Excel fills up a section of worksheet with the command equivalent of the menu selections and cell pointing you carry out with the mouse. You then stop the recorder, give the macro a name and you can invoke it any time you like from a macro menu. Excel also lets you associate a control key with a macro if you prefer.

Since the macro text is kept on a worksheet you can fine tune it by hand, manipulating it like ordinary worksheet data. When you get more advanced you can set up macros which interact with the user, demanding data at appropriate moments.

Experience with 1-2-3 suggests that macros do more than simply speed up the way you do repetitive tasks. As they greatly extend the range of things you can do they help create a market for pre-programmed spreadsheet solutions. Microsoft says it is already talking to third-party suppliers who are working on such products for Excel.

CONCLUSIONS

- Excel can reasonably accurately be described as a complete implementation of Microsoft's existing Chart package, sitting on top of a king-size Multiplan, with database and macro facilities thrown in.
- Compared to Lotus 1-2-3 Excel offers easier macros, more different chart types, and a spreadsheet which is, theoretically at least, bigger.
- Excel's strongest competitor is Jazz; Excel offers macros and on-line help, which Jazz lacks, and more tightly integrated charting. Excel's database is more limited than Jazz's, and it lacks a built-in word processor; but Excel has Switcher instead.
- Switcher greatly enhances existing Mac data-transfer functions and opens up the possibility of do-it-yourself integration. We found Excel worked well with Macwrite, for instance, courtesy of Switcher.
- As far as speed is concerned, with our pre-release version of Excel we could not make any fair comparison with Excel's main rivals — 1-2-3, Jazz and Multiplan.
- Excel stands out as a landmark package for the Mac. It should prove a serious rival to 1-2-3 when the IBM PC version comes out. PC

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If you write in with a comment, correction or enquiry please state the machine and the program title.

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BY NICHOLAS McCUTCHEON

KEY LISTER

ONE OF THE MOST useful features of the BBC Micro is the function keys: the ability to program mini-definitions easily in Basic is a real time-saver.

The trouble is that with only 10 function keys available many of them are redefined during a programming session. From time to time, you forget what is behind the red keys. One method of finding the definitions is to issue an Auto command and then press the particular key you wish to investigate. Obviously this solution is far from ideal, and Shingo Sugiura has submitted a utility for displaying the contents of the function keys in a readable format.

The bulk of the program comes in the Rem statements in the assembler listing, which need not be entered. Once you have typed the code in, save it before you run it. Now raise Page by &100 by typing

PAGE=PAGE+&100

and chain in the source code. This is necessary because the routine will assemble its code at the old value of Page.

If all goes well, save the assembled code for later use with *Run. Now press Break to initialise the utility. From now on, Page will be raised by &100 so that the machine code is not corrupted by your Basic programs. The assembled code is invoked simply by typing *Code or *Line.

KEY LISTER

```
   10 REM Function key lister
   20 REM By Shingo Sugiura
   30 REM April 1985
   40
   50 MODE7
   60 page=&1900
   70 REM Change above line to "pag
e=&E00" for tape system
   80 IF PAGE<page+&100 PRINT"Move
source code":END
   90 PROCassemble
  100 PRINT'"To save assembled code
, type:"'
  110 PRINT"*SAVE""OBJECT""";~page;
" ";~P%;" ";~connect''
  120 PRINT"To initialise utility,
press BREAK"'
  130 PRINT'"*LINE or *CODE to invo
ke utility"
  140 CALLconnect
  150 END

  160 DEFPROCassemble
  170 ptr=&2A:start=&2B:length=&2C:
loop=&2D
  180 oswrch=&FFEE:osnewl=&FFE7:osb
yte=&FFF4
  190 FOR pass=0 TO 2 STEP2:P%=page

  200 [OPT pass
  210 .break
  220                             \Thi
s routin is called everytime
  230                             \BRE
AK or CTRL-BREAK is pressed.
  240       BCC first             \Car
ry set?
  250       LDA#FNlo(keys)        \Red
irect USER vector
  260       STA &200              \To
point to key lister utility
  270       LDA#FNhi(keys)
  280       STA &201
  290       LDX#FNhi(page+&100) \Set
 PAGE so that machine code
  300       LDY#0                 \rou
tine does not get corrupted
  310       LDA#180               \by
Basic
  320       JMP osbyte
  330 .first
  340       RTS
  350 .connect
  360       LDA#&4C               \Thi
s routine is called when the object
 code
  370       STA &287              \is
*RUN.
  380       LDA#FNlo(break)       \The
 USER vector is set to point to the
  390       STA &288              \sea
rch routine.
  400       LDA#FNhi(break)       \BRE
AK is intercepted.
  410       STA &289
  420       RTS
  430 .keys
  440       LDA#0:STA loop        \Ini
tialise function key counter
  450 .outer
  460       LDY loop
  470       LDA &800,Y
  480       STA ptr
  490       LDA #255              \Ini
tialise length
  500       STA length
  510       LDY #0                \Cou
nter
  520 .inner
  530       LDA &800,Y            \Fin
d the offset of current key
  540       STA start
  550       CPY loop
  560       BEQ next
  570       SEC
  580       CMP ptr
  590       BCC next
  600       SEC
  610       LDA start
  620       CMP length
  630       BCS length_big
  640       STA length            \New
 value of length
  650 .length_big
  660       LDA start
  670       CMP ptr:BEQ out
  680 .next
  690       INY
  700       CPY#15
  710       BNE inner
  720       LDA #255              \Rei
nitialise length of definition
  730       CMP length
  740       BEQ out
  750       JSR list              \Go
and print the definition
  760 .out
  770       INC loop              \Inc
rement function key counter
  780       LDA loop              \Don
e 16 functio keys?
  790       CMP#15
  800       BNE outer
  810       RTS                   \Bac
k to Basic
  820 .list
  830       LDA#ASC"*"            \Pri
nt "*"
  840       JSR oswrch
  850       LDA#ASC"K"            \Pri
nt "K"
  860       JSR oswrch
  870       LDA#ASC"E"            \Pri
nt "E"
  880       JSR oswrch
  890       LDA#ASC"Y"            \Pri
nt "Y"
  900       JSR oswrch
  910       LDA#ASC" "
  920       JSR oswrch            \To
make up "*KEY"!
  930       LDA loop
  940       CMP#10
  950       BCC one_digit         \Pri
nt the function key No.
  960       LDA #8
  970       JSR oswrch            \If
>=10, backspace cursor
  980       LDA#ASC"1"            \the
n print "1"
  990       JSR oswrch
 1000       SEC                   \Pri
nt the unit value
 1010       LDA loop
 1020       SBC #10
 1030 .one_digit
 1040       ORA#&30               \by c
alculating the ASCII value
 1050       JSR oswrch            \and
calling OSWRCH
 1060       LDA#ASC" "
 1070       JSR oswrch
 1080 .print                      \Now
print the key definition
 1090       INC ptr
 1100       LDY ptr
 1110       LDA &800,Y            \Load
part of definition into A
 1120       PHA
 1130       BPL positive          \Is i
t >128?
 1140       LDA#ASC"|"            \If s
o, print "|!"
 1150       JSR oswrch
 1160       LDA#ASC"!"
 1170       JSR oswrch
 1180 .positive
 1190       PLA:AND #127          \Sub
tract 127
 1200       CMP#ASC" "
 1210       BCS asc               \Is
it an ASCII value
 1220       PHA
 1230       LDA#ASC"|"            \No.
So print "|"
 1240       JSR oswrch
 1250       PLA:ORA #64           \Add
64
 1260 .asc
 1270       JSR oswrch            \Pri
nt definition
 1280       CPY length            \End
of the definition
 1290       BNE print
 1300       JMP osnewl            \New
line, end of subroutine
 1310 ]NEXT
 1320 ENDPROC
```

KEY LISTER

```
1330 DEFFNlo(number)=number MOD 25
6
1340 DEFFNhi(number)=number DIV 25
6
1350 DEFFNequs(string$)
1360 $P%=string$
1370 P%=P%+LEN(string$)
1380 =0
```

COPYK

ACORNSOFT has released a Basic editing ROM which allows you to treat a Basic program just like a piece of View text. This includes moving blocks of program code around.

Des Fisher has written a utility to move program code around within Basic programs. The CopyK program resides in memory along with the program to be edited, except that it is transparent to the user. It is invoked by pressing function key 9. This sets Page to the start of the CopyK program and runs it. When it has finished, it resets Page to the start of the edited program. Page is the variable that marks the start of a Basic program.

Type in CopyK as it is and save it. To use it press function key 8 once at the beginning of the session, after which you press function key 9 to call it.

Function key 8 deletes the explanatory lines of code that come with CopyK and relocates it to just below Himem. It also clears the function-key buffer so that the commands which CopyK requires to place into the buffer, will fit. As *FX18 is only implemented from OS1.0, the piece of code that does this might look ungainly.

When invoked, the utility asks for the start line number of the code block to be copied, checks that it exists, asks for the end line number of the copy block and asks for the line number the copy block is to be inserted before.

You may just press 0 Return in answer to the end line number question, if only one line of code is to be copied. The copy block is renumbered with an increment of one to squeeze in as many lines as possible before meeting the next program line.

If the program to be edited is large, it might overwrite the code of CopyK when copying lines so always use Mode 7 to ensure maximum room when using CopyK. As a final safety precaution, make a backup copy of the program to be edited before invoking CopyK.

COPYK

```
  10 REM COPYK                    des
 fisher   Wix (025587) 341
  20 REM COPYK is a header program
, lines 10-450, that gives instruct
ions
  30 REM and sets key f8 to reloca
te the main program, lines 460-1000
,
  40 REM for access from key f9.
  50 REM The main program may be '
packed' to save space but NOTE the
  60 REM delete command in key f8,
 line 380, is line number dependant
.
  70 REM The main program is about
 1.5K.
  80


  90  MODE 7
 100  PRINT''CHR$(141)"COPYK"
 110  PRINT CHR$(141)"COPYK"
 120  PRINT'" des fisher  1983"
 130  PRINT''"This program enables
 you to copy lines"
 140  PRINT"in a BASIC program."
 150  PRINT'"To use press user def
ined key f8 to"
 160  PRINT"initalise this program
."
 170  PRINT'"Only do this ONCE."
 180  PRINT"Wait for the > prompt.
"
 190  PRINT"Load the program to be
 operated on and"
 200  PRINT"press f9 to copy."
 210  PRINT'"The only limitation o
n use is that the"
 220  PRINT"resident integer varia
ble Z% is not"
 230  PRINT"affected by running an
other program."
 240


 250 REM ** Clear user defined key
s **
 260  *KEY 0
 270  *KEY 1
 280  *KEY 2
 290  *KEY 3
 300  *KEY 4
 310  *KEY 5
 320  *KEY 6
 330  *KEY 7
 340  *KEY 8
 350  *KEY 9
 360


 370 REM ** Set keys f8 and f9 **
 380  *KEY 8DEL.10,450|MP%=PA.:T%=
TOP:PA.=H.-T%+P%:Z%=PA.:C%=-1:F. I=
P% TO T%:C%=C%+1:?(PA.+C%)=?I:N.|MP
A.=P%|M
 390  *KEY 9P%=PAGE:X%=TOP:PAGE=Z%
|MRUN|M
 400
 410  END
 420
 430


 440 REM ** Relocated BASIC Progra
m **
 450
 460  INPUT"Source start line no",
S%
 470  T%=P%
 480  REPEAT
 490    J%=?(T%+1)*16*16+?(T%+2)
 500    IF J%<>S% THEN T%=T%+?(T%+
3)
 510  UNTIL J%=S% OR ?(T%+1)=&FF
 520  IF J%<>S% THEN PRINT"Line ";
S%;" not found":PAGE=P%:END
 530
 540    INPUT"Source end line no (
0=start line)",U%
 550    IF U%=0 THEN U%=S%
 560    I%=P%
 570    REPEAT
 580      J%=?(I%+1)*16*16+?(I%+2)
 590      IF J%<>U% THEN I%=I%+?(I
%+3)
 600    UNTIL J%=U% OR ?(I%+1)=&FF
 610    IF J%<>U% THEN PRINT"Line
";U%;" not found":PAGE=P%:END
 620      V%=I%
 630      M%=0:I%=T%
 640      REPEAT
 650        M%=M%+1
 660        I%=I%+?(I%+3)
 670      UNTIL I%>V%
 680      K%=V%-T%+?(V%+3)
 690
 700      INPUT"Line no to insert
above",D%
 710      I%=P%
 720      REPEAT
 730        J%=?(I%+1)*16*16+?(I%+
2)
 740        IF J%<>D% THEN I%=I%+?
(I%+3)
 750      UNTIL J%=D% OR ?(I%+1)=&
FF
 760      IF J%<>D% THEN PRINT"Lin
e ";D%;" not found":PAGE=P%:END
 770        F%=I%+?(I%+3)
 780        E%=?(F%+1)*16^2+?(F%+
2)
 790        IF E%-D%<=M% PRINT"No
t enough room at destination":PAGE=
P%:END
 800          REM Move lines abov
e destination line
 810          IF D%<S% THEN T%=T%
+K%:V%=V%+K%
 820          FOR J%=X% TO F%  ST
EP-1
 830            ?(J%+K%)=?J%
 840          NEXT

 850          REM Copy source lin
es
 860          REPEAT
 870            D%=D%+1:REM inc d
estination line no
 880            F%=F%+1
 890            ?F%=D%/16^2:REM P
oke line no
 900            ?(F%+1)=D%-?(F%)*
16^2
 910            I%=T%+?(T%+3)
 920            T%=T%+2
 930            F%=F%+1
 940            REPEAT
 950              F%=F%+1
 960              T%=T%+1
 970              ?F%=?T%
 980            UNTIL T%=I%
 990          UNTIL T%>V%
1000          PAGE=P%
1010  END
```

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STOCK OPTIONS

Mike Lewis presents some more formulae for calculating sensible reorder levels on a spreadsheet.

DONALD is a friend of mine who owns a commercial stationery shop in west London. He phoned me a while ago to ask for advice about "putting stock control on the computer", the computer in question being Donald's 18-month-old Apricot. He had, it seemed, three big problems which he hoped the computer could solve.

SATISFYING DEMAND

Donald's first problem was that he found it very hard to keep up with demand for certain products. One moment he would have a healthy supply of typing paper. The next moment, half the neighbourhood would decide to buy typing paper and by the end of the day the shelf would be bare. Of course, he could stock more in the first place, but his second problem was that storage space was in pretty short supply. Thirdly, he simply did not have the time to go round checking his inventory at regular intervals.

So I started to make enquiries about stock-control packages for MS-DOS and CP/M, and before long the brochures were landing on my desk. Alas, I drew a blank. It seems that there are many excellent packages on the market that will tell you what your stock is and, in particular, whether it has reached a pre-defined reorder level. But what Donald needed to know was what the stock should be — or how much he should order to minimise stockouts without having to rent another storeroom.

NO SOLUTION

Furthermore, most stock-control packages expect the user either to record details of all stock movements, or to do a full stock check at regular intervals. This is fine for a firm dealing in low-volume, high-value goods, or for a wholesaler with relatively few deliveries. But a retailer with a large inventory of fast-moving products would have to find some other solution.

In Donald's case, the answer turned out to be quite simple, and it didn't even involve him in any additional software. To explain it to him, I first had to point out that there are two fundamentally different approaches to stock control: You can either establish a fixed set of reorder levels and quantities, with new orders being triggered when the predetermined level is reached; or you can review stocks on a periodic basis, recalculating the order quantity each time.

It was the first of these approaches that we adopted for the stationery shop. This was partly to avoid the need for a stock check

(continued on next page)

SPREADSHEET 2

PRODUCT	Av. Weekly Demand (units) D	Leadtime (weeks) L	Service Level k	Standard Deviation S	Re-order Level (units) DL+kS*SQRT(L)	Order Costs (£) C	Holding Cost/Unit (£ p.a.) H	Annual Demand (units) A	Order Quantity (units) SQRT(2CA/H)
A4 bond (ream)	60	1.0	3	8.0	84	2.5	1.20	3030	112
F'cap bond (ream)	32	1.0	1	4.5	37	2.5	1.30	1616	79
A4 bank (ream)	55	1.0	3	2.5	63	2.5	1.20	2777	108
A4 carbon (10s)	20	1.2	2	3.8	32	1.5	1.40	1010	47
Ball-point Pens (50s)	550	0.4	3	7.7	235	1.5	0.10	27775	913
Perm. Marker (25s)	190	0.4	2	9.8	88	1.5	0.50	9595	240
Wash. Marker (25s)	205	0.4	2	8.8	93	1.5	0.50	10352	249
Jumbo Sign Pen (5s)	88	0.4	1	12.4	43	1.5	0.60	4444	149
White DL env (50)	440	0.8	3	2.5	359	1.5	0.75	22220	298
Manilla DL env (50s)	520	0.8	3	3.1	424	1.5	0.70	26260	335
Manilla C4 env (50s)	104	0.8	2	5.7	93	1.5	0.68	5252	152
Extra Weight C4 (doz)	30	0.8	1	3.6	27	1.5	0.80	1515	75
Parcel Bands (100 gm)	60	1.0	2	2.0	64	3.0	0.60	3030	174

The calculation of reorder level and economic order quantity. It only needs to be repeated when circumstances change.

SPREADSHEET 1

PRODUCT	Order Qty (units) Q	Annual Demand (units) A	Cost per Order (£) C	Order Cost p.a. (£) x=CA/Q	Re-order Level (units) (M)	Weekly Demand (units) D	Leadtime (weeks) L	Holding Cost/Unit (£ p.a.) H	Tot Hldg Cost p.a. (£) H(M-DL+Q/2) y	Tot Cost p.a. (£) x+y
A4 bond (ream)	112	3030	2.50	68	84	60	1.0	1.20	96	164
F'cap bond (ream)	79	1616	2.50	51	37	32	1.0	1.30	58	109
A4 bank (ream)	108	2777	2.50	64	63	55	1.0	1.20	74	138
A4 carbon (10s)	47	1010	1.50	32	32	20	1.2	1.40	44	76
Ball-point Pens	913	27775	1.50	46	235	550	0.4	0.10	47	93
Perm. Marker	240	9595	1.50	60	88	190	0.4	0.50	66	126
Wash. Marker	249	10352	1.50	62	93	205	0.4	0.50	68	130
Jumbo Sign Pen	149	4444	1.50	45	43	88	0.4	0.60	49	94
White DL env (50)	298	22220	1.50	112	359	440	0.8	0.75	117	229
Manilla DL env(50)	335	26260	1.50	118	424	520	0.8	0.70	123	241
Manilla C4 env(25)	152	5252	1.50	52	93	104	0.8	0.68	58	110
Extra Weight C4	75	1515	1.50	30	27	30	0.8	0.80	32	62
Parcel Bands	174	3030	3.00	52	64	60	1.0	0.60	55	107

You can modify the spreadsheet to determine the overall stock-holding costs. Changing the input parameters shows the effect on costs.

(continued from previous page)

every week or fortnight, and partly because demand was too volatile for such a long review period. In practice, Donald ordered new supplies almost every day.

We ended up with a system of markers or dividers, physically inserted in the stock at the reorder point. When a ream of typing paper was removed from the shelf to reveal the marker, the staff knew that it was time to place an order. The problem thus resolved itself to deciding two parameters: the reorder point and the reorder quantity. These are both one-off calculations, in the sense that you do not need to repeat them from week to week, although this does not mean that they should not be reviewed as circumstances change.

REORDER LEVEL

The reorder level is, by definition, the amount of stock you need to see you through the lead time for delivery. You can think of this as being made up of two components: the basic stock needed to satisfy average demand, and the safety stock which you need in case demand exceeds the average. In last month's article — "Looking Ahead", *PC* October, page 121 — I explained how to forecast demand per unit time. If you call this D and the lead time L, the basic stock is simply $D \times L$.

To arrive at the safety stock, you need to decide what risk of a stock-out you are willing to accept. For example, Donald felt that his shop would suffer an unacceptable loss of credibility if he ran out of ball-point pens, pencils or paper clips. Such products are said to need a high service level. On the other hand, a ribbon for an obscure typewriter might need a lower service level because the customers cannot find it elsewhere and will be willing to wait for supplies.

You should assign to each product a service level of 1, 2 or 3, to correspond to low, medium and high respectively. If k is the service level and s is the standard deviation of demand — which we also saw last month how to calculate — the safety stock is:

$$k \times s \times \sqrt{L}$$

So the reorder level, M, is:

$$D \times L + k \times s \times \sqrt{L}$$

The second stage of the process is to calculate the order quantity. This is a fixed amount, which does not depend on the forecast demand for the coming period, but which is chosen to minimise inventory costs.

Inventory costs fall into two groups. First, there are the expenses involved in placing an order, including staff time, postage, and any fixed delivery charges — but not delivery costs that are invoiced as a percentage of the goods ordered, these rightly being reckoned as part of the purchase price. If you were using this system for a manufacturing process, the relevant costs would be those of setting up a production run.

Secondly, there are the costs of holding the goods. This covers storage, heating, insurance, interest charges, shrinkage, etc. It is very difficult to give general advice about this. You might decide, for example, that your storage costs are nil because you are paying for your premises anyway and storing any extra goods will make no difference. By contrast, Donald assigned a high cost to storage, to reflect the fact that space was at a premium.

If the cost of placing an order is C, the annual holding cost of a single item is H, and the annual sales, in units, is A, the following formula can be used to calculate the economic order quantity — that is, the size of the order, Q, which gives the lowest total cost:

$$Q = \sqrt{((2 \times C \times A)H)}$$

These calculations are very easy to set up with Multiplan, Supercalc, or a similar program. Spreadsheet 1 shows an example. Alternatively, you can take a slightly different approach by working out the total annual costs for various combinations of order size, service level and lead time, as shown in spreadsheet 2. A What-If? exercise on these figures will quickly tell you whether it is worth pressing your suppliers for faster deliveries, or altering service levels of any borderline products.

SOME PROBLEMS

Although these formulae are widely used, they are not without snags. One common criticism is that the overall aim should not be to minimise stock-holding costs, but rather to maximise profits. For example, the technique does not take account of the cost of a stock-out, or of the relative profit margins of the items held. Also it makes no attempt to deal with price breaks. In practice, it is often worth ordering slightly more than the calculated quantity if to do so would qualify you for a better discount.

For these reasons, the calculations outlined here should not be used blindly. Treat the output from your spreadsheets as suggestions only, and do not be afraid to play What-If? with the results. If you find, as Donald did, that you can empty some of the shelves in your storeroom and still keep the customers happy, it will be well worth the effort. PC

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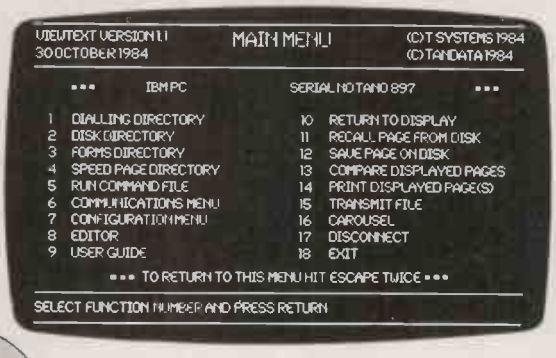

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CONTROL CHARACTER CHECKER

John and Timothy Lee present a utility to add to eight-bit CP/M WordStar implementations that checks whether printer-control characters are paired off.

MANY microcomputers are used heavily for word processing, and WordStar probably remains the most widely used WP program. It has many desirable features, but the way it handles print enhancements is not one of them. For example, to get bold characters it is necesarry to type the control sequence

Ctrl-P Ctrl-B

both before and after the characters to be printed in bold.

Problems will arise if you accidentally delete one of the pair of control characters, so that a print enhancement is turned on but is not turned off again. This mistake is particularly likely to occur if you have turned off the control-character display. WordStar does not check that control characters are paired, and you only discover the problem at print time, when half your carefully laid-out text emerges in enhanced type, instead of only the word or two that you intended.

Our Check routine is a simple machine-code program for eight-bit CP/M machines which scans a WordStar text file to ensure that the print-control characters have all been paired off. To run the program simply type

CHECK filename.extension

The program looks for the specified file name on the logged-in disc and reads it in character by character. It keeps a flag for each of the WordStar print-control characters ^B, ^D, ^S, ^X, ^V, ^T and ^Y. Every time one of these characters is read, the appropriate flag is toggled. When it reaches the end-of-file character the program stops reading. It checks the state of each of the control-character toggles and displays messages indicating whether the control characters for bold, double strike, underline, etc. are paired or unpaired.

In the program listing, the source code is given in Intel mnemonics, along with comments and the hexadecimal code produced by the standard CP/M assembler ASM. Anyone with CP/M-80 should be able to use the program. To produce an executable .Com file, first type the mnemonics into a file called Check.ASM. This file should be an exact copy of the listing, except that the first 15 characters of each printed line, which actually constitute the code translated into hexadecimal, should be omitted. They type the command

ASM CHECK

to make the CP/M assembler produce a .Hex hexadecimal file. Finally type the command

LOAD CHECK

to produce an executable file called Check.Com.

While the Check program is executing it indicates that it is actually running by continually underlining the sign-on message. Large text files take an appreciable amount of time to check, and with them an indication that the program is working is particularly useful. This visible indication can be switched off by setting the flag on line 8 to read

FVISIB EQU FALSE

CHECK ROUTINE

```
0100                    ORG     100H
0000 =                  FALSE   EQU     0
FFFF =                  TRUE    EQU     NOT FALSE
                ;
                ;       A visible indication that the program is executing
                ;       is provided by setting the following flag TRUE
                ;       Set FALSE if the indication is not required.
FFFF =                  FVISIB  EQU     TRUE
                ;
0000 =          REBOOT  EQU     0
0005 =          CPM     EQU     5
                ;
0007 =          BELL    EQU     7       ;ASCII BELL character
0009 =          TAB     EQU     9       ;ASCII TAB character
000A =          LF      EQU     0AH     ;ASCII LineFeed
000D =          CR      EQU     0DH     ;ASCII Carriage Return
001A =          EOF     EQU     26      ;CP/M End-Of-File character
                ;
005C =          FCB     EQU     5CH     ;Address of default CP/M FCB
0080 =          FILBUF  EQU     80H     ;Address of default CP/M buffer
                ;
0100 C37103             JMP     START
0103 0D0A0A0943         DB      CR,LF,LF,TAB, 'CHECK',CR,LF,LF
010F 50726F6772         DB      'Program to check that WordStar Control characters '
0141 6172652070         DB      'are paired in an input file',CR,LF
015E 5665727369         DB      'Version 2.2',CR,LF
016B 5772697474         DB      'Written by Timothy D. Lee   25 May 1985',CR,LF,LF,EOF
                ;
0196 0D0A0A576FSIGNON:  DB      CR,LF,LF,'WordStar Enhancement Check Program',CR,LF,'$'
01BE 070D0A596FMSNAME:  DB      BELL,CR,LF,'You must supply a filename when'
01ED 20696E766F         DB      ' invoking CHECK', CR,LF
01F1 6567202041         DB      'eg  A> CHECK report.txt',CR,LF,BELL,'$'
020C 070D0A5468MSEXST:  DB      BELL,CR,LF,'The filename supplied does not'
022D 2065786973         DB      ' exist on the current disk',CR,LF,BELL,'$'
                ;
024B 0D0A0A4669RESULT:  DB      CR,LF,LF, 'File analysed',CR,LF,LF
025E 5E42202842         DB      '^B (Bold)              '
0279 2020706169CTRLB:   DB      '  paired. ',CR,LF
0285 5E44202844         DB      '^D (Double-Strike )    '
02A0 2020706169CTRLD:   DB      '  paired. ',CR,LF
02AC 5E53202855         DB      '^S (Underline)         '
02C7 2020706169CTRLS:   DB      '  paired. ',CR,LF
02D3 5E54202853         DB      '^T (Super-script)      '
02EE 2020706169CTRLT:   DB      '  paired. ',CR,LF
02FA 5E56202853         DB      '^V (Sub-script)        '
0315 2020706169CTRLV:   DB      '  paired. ',CR,LF
0321 5E57202853         DB      '^W (Strike-out)        '
033C 2020706169CTRLX:   DB      '  paired. ',CR,LF
0348 5E59202843         DB      '^Y (Change ribbon colour)  '
0363 2020706169CTRLY:   DB      '  paired. ',CR,LF,LF,'$'
                ;
0371 317E04     START:  LXI     SP,STACK
0374 119601             LXI     D,SIGNON
0377 0E09               MVI     C,9
0379 CD0500             CALL    CPM             ;Print Signon Message
037C 3A5D00             LDA     FCB+1
037F FE20               CPI     ' '             ;Check if a file name supplied
0381 11BE01             LXI     D,MSNAME
0384 CA3404             JZ      ERROR           ;else error
                ;
0387 115C00             LXI     D,FCB
038A 0E0F               MVI     C,15
```

(continued on page 144)

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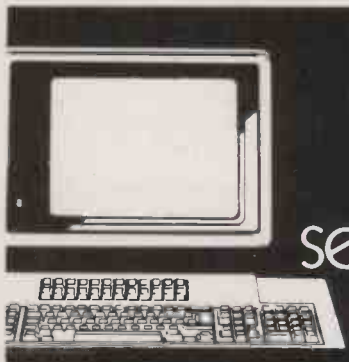

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CHECK ROUTINE

(continued from page 141)

```
038C CD0500          CALL    CPM             ;Try to open the file
038F 3C              INR     A
0390 110C02          LXI     D,MSEXST
0393 CA3404          JZ      ERROR           ;jump if error
                ;
0396 CDE703  LOOP:   CALL    GETCHR
0399 FE1A            CPI     EOF
039B CADC03          JZ      ATEOF           ;Jump if End of File
039E F29603          JP      LOOP            ;Ignore unless a control char.
                ;
03A1 217902          LXI     H,CTRLB
03A4 FE02            CPI     'B'-40H         ;is it Control B (BOLD)
03A6 CC1904          CZ      TOGGLE
03A9 21A002          LXI     H,CTRLD
03AC FE04            CPI     'D'-40H         ;is it Control D (DOUBLE-STRIKE)
03AE CC1904          CZ      TOGGLE
03B1 21C702          LXI     H,CTRLS
03B4 FE13            CPI     'S'-40H         ;is it Control S (UNDERLINE)
03B6 CC1904          CZ      TOGGLE
03B9 21EE02          LXI     H,CTRLT
03BC FE14            CPI     'T'-40H         ;is it Control T (SUPERSCRIPT)
03BE CC1904          CZ      TOGGLE
03C1 211503          LXI     H,CTRLV
03C4 FE16            CPI     'V'-40H         ;is it Control V (SUBSCRIPT)
03C6 CC1904          CZ      TOGGLE
03C9 213C03          LXI     H,CTRLX
03CC FE18            CPI     'X'-40H         ;is it Control X (STRIKE-OUT)
03CE CC1904          CZ      TOGGLE
03D1 216303          LXI     H,CTRLY
03D4 FE19            CPI     'Y'-40H         ;is it Control Y (COLOUR-CHANGE)
03D6 CC1904          CZ      TOGGLE
03D9 C39603          JMP     LOOP
                ;
                ;       Jump here when End Of File reached
                ;
03DC 0E09    ATEOF:  MVI     C,9
03DE 114B02          LXI     D,RESULT
03E1 CD0500          CALL    CPM             ;Print Results
03E4 C30000          JMP     REBOOT
                ;
                ;       Subroutine to get next character from file.
                ;       Character is returned in E and A registers.
                ;       Returns ^Z at end of file
                ;
03E7 3A3C04  GETCHR: LDA     POINTR
03EA 3C              INR     A               ;Increment POINTR
03EB CCF903          CZ      GETSEC          ;Get next sector
03EE 6F              MOV     L,A
03EF 2600            MVI     H,0             ;Set HL = POINTR

03F1 323C04          STA     POINTR          ;store new POINTR
03F4 7E              MOV     A,M             ;get next byte
03F5 E67F            ANI     07FH            ;strip parity
03F7 5F              MOV     E,A

03F8 C9              RET
                ;
                ;       Read Next Sector from disk file
                ;
03F9 115C00  GETSEC: LXI     D,FCB
03FC 0E14            MVI     C,20
03FE CD0500          CALL    CPM             ;Read next sector from disk
                ;
                IF      FVISIB          ;Visible display of progress
0401 1E3D            MVI     E,'='
0403 3A3D04          LDA     COUNT
0406 3D              DCR     A
0407 C20E04          JNZ     VISIB2
040A 3E23            MVI     A,35
040C 1E0D            MVI     E,CR
040E 323D04  VISIB2: STA     COUNT
0411 0E02            MVI     C,2
0413 CD0500          CALL    CPM
                ENDIF
0416 3E80            MVI     A,FILBUF
0418 C9              RET
                ;
                ;       Subroutine to Toggle the 'paired/unpaired' state of
                ;       the Control Character pointed to by HL
                ;
0419 7E      TOGGLE: MOV     A,M             ;get first character
041A 110800          LXI     D,8
041D FE75            CPI     'u'
041F CA2B04          JZ      TOGGL2          ;Jump if unpaired
                ;       used to be paired so this character makes it unpaired
0422 3675            MVI     M,'u'           ;set unpaired
0424 23              INX     H
0425 366E            MVI     M,'n'
0427 19              DAD     D
0428 3607            MVI     M,BELL
042A C9              RET
                ;       used to be unpaired so this character makes it paired
042B 3620    TOGGL2: MVI     M,' '           ;set paired
042D 23              INX     H
042E 3620            MVI     M,' '
0430 19              DAD     D
0431 3620            MVI     M,' '
0433 C9              RET
                ;
                ;       Jump here if an error occurs
                ;
0434 0E09    ERROR:  MVI     C,9
0436 CD0500          CALL    CPM             ;Print appropriate Error message
0439 C30000          JMP     REBOOT
                ;
043C FF      POINTR: DB      0FFH
043D 23      COUNT:  DB      35
043E                 DS      64
             STACK:
047E                 END
```

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PASCAL CALENDAR GENERATOR

MANY commercial Apple programmers use Pascal, and the language also has a small but faithful following among home users. However, the bulk of home users continue to program in Applesoft, and it was therefore nice to receive a useful calendar program in Pascal from Piers Chapple. The program will produce a calendar for any year required between 1752 and 4902, the two extremes of the Gregorian calendar.

It works by using Zeller's Congruence to calculate the day of the week on which 1 January falls in a given year, and then calculates the dates of two months at a time, which are then printed, and then a further two months are calculated and printed, and so on for the whole year.

Zeller's Congruence calculates the day of the week of any date within the Gregorian calendar. Zeller's formula is

((2.6M − 0.2) + D + Y + (Y DIV 4) + (C DIV 4) − 2C) MOD 7

where D is the day of the month, M is the month number where March is equal to 1 and February is equal to 12, Y is the year in the century, and C is the two most significant digits from the year.

A modified version of the formula is used in the program. Before performing the Mod 7 operation in the program, a large number is added in order to prevent a negative result being returned, but still producing an accurate calendar. The day on which January 1 falls is found by using the relationship shown in the table.

The program should prove easy to implement on other computers since it does not make use of Applestuff. The only assumption is that the printer or screen can display 80 characters per line. The author of the program used an Apple Silentype printer, and line 12 of the program instructs Apple Pascal that a printer is to be used by defining S as Interactive. This means that when a Write or WriteLn statement is reached which contains an S, then the output is sent to the printer.

FIRST DAY OF THE YEAR

	SUN	MON	TUE	WED	THU	FRI	SAT
Value from formula	1	0	−1	−2	−3	−4	−5

PASCAL CALENDAR

```
]PROGRAM CALENDAR;

(*PROGRAM TO CALCULATE A CALENDAR FOR ANY YEAR REQUIRED FROM 1752 TO 4902  *)
(*USING ZELLERS CONGRUENCE                                                 *)
(*                                                                         *)
(*                    PROGRAM WRITTEN BY PIERS CHAPPLE                     *)


(*VARIABLE DECLARATIONS*)
VAR

S : INTERACTIVE;    (*SENDS OUTPUT TO THE SILENTTYPE PRINTER*)

TABLE : ARRAY [1..2,1..42] OF INTEGER;   (*HOLDS THE DAYS OF TWO MONTHS*)
DAYSINMONTH : ARRAY [1..2] OF INTEGER;   (*HOLDS THE LENGTH OF TWO MONTHS*)

YEARREQ,       (*HOLDS THE YEAR REQUIRED*)
YRSTARTA,      (*TEMPORARY VARIABLE FOR CALCULATING THE FIRST DAY OF THE YEAR*)
YRSTARTB,      (*TEMPORARY VARIABLE FOR CALCULATING THE FIRST DAY OF THE YEAR*)
DAYCALC,       (*HOLDS THE FIRST DAY OF THE YEAR*)
LEAPYEAR,      (*CALCULATES WHETHER THE YEAR IS A LEAP YEAR*)
EOMONTH,       (*THIS IS SET WHEN THE END OF A MONTH IS REACHED*)
DAYSREM,       (*HOLDS THE NUMBER OF DAYS REMAINING IN THE WEEK*)
COUNTA,        (*USED FOR PRINTING OUT THE DATES*)
COUNTB,        (*USED FOR PRINTING OUT THE DATES*)
LOOPA,         (*MAIN ROUTINE LOOP*)
LOOPB,         (*LOOP USED WHEN LOADING ARRAY WITH DAYS OF THE MONTH*)
LOOPC,         (*LOOP USED FOR GENERAL PURPOSE*)
LOOPD,         (*LOOP USED FOR PRINTING OUT THE DATES*)
LOOPE:         (*LOOP USED FOR PRINTING OUT THE DATES*)
INTEGER;




(*WORKS OUT MONTH AND LENGTH OF MONTH*)
PROCEDURE WHICHMONTH (LOOPA : INTEGER);
BEGIN
  WRITE(S,' ':9);
  CASE LOOPA OF
    1 : BEGIN
        DAYSINMONTH[1]:=31;
        DAYSINMONTH[2]:=28 + LEAPYEAR;
        WRITE(S,'  JANUARY ',YEARREQ:4);
        WRITELN(S,' ':30,' FEBRUARY ',YEARREQ);
        END;
    2 : BEGIN
        DAYSINMONTH[1]:=31;
        DAYSINMONTH[2]:=30;
        WRITE(S,'     MARCH ',YEARREQ:4);
        WRITELN(S,' ':30,'     APRIL ',YEARREQ);
        END;
```

(continued on next page)

PASCAL CALENDAR

(continued from previous page)

```
     3 : BEGIN
         DAYSINMONTH[1]:=31;
         DAYSINMONTH[2]:=30;
         WRITE(S,'       MAY ',YEARREQ:4);
         WRITELN(S,' ':30,'      JUNE ',YEARREQ);
         END;
     4 : BEGIN
         DAYSINMONTH[1]:=31;
         DAYSINMONTH[2]:=31;
         WRITE(S,'      JULY ',YEARREQ:4);
         WRITELN(S,' ':30,'    AUGUST ',YEARREQ);
         END;
     5 : BEGIN
         DAYSINMONTH[1]:=30;
         DAYSINMONTH[2]:=31;
         WRITE(S,'SEPTEMBER ',YEARREQ:4);
         WRITELN(S,' ':30,'  OCTOBER ',YEARREQ);
         END;
     6 : BEGIN
         DAYSINMONTH[1]:=30;
         DAYSINMONTH[2]:=31;
         WRITE(S,' NOVEMBER ',YEARREQ:4);
         WRITELN(S,' ':30,' DECEMBER ',YEARREQ);
         END;
   END;
END;


(*-------------------------------------------------------------------------*)


BEGIN  (*PROGRAM*)


(*INITIALISE VARIABLES*)

REWRITE(S,'PRINTER:');

YEARREQ:=0;
YRSTARTA:=0;
YRSTARTB:=0;
DAYCALC:=0;
LEAPYEAR:=0;
EOMONTH:=0;
DAYSREM:=0;
COUNTA:=0;
COUNTB:=0;



(*FINDS OUT REQUIRED YEAR*)
WRITELN('FOR WHICH YEAR DO YOU REQUIRE A');
WRITE('CALENDAR (1752-4902)?: ');
READLN(YEARREQ);


(*CHECKS WHETHER REQUIRED YEAR IS VALID*)
IF (YEARREQ < 1752) OR (YEARREQ > 4902) THEN
WRITELN('THE REQUIRED YEAR IS INVALID') ELSE

  BEGIN  (*CALENDAR*)


(*WORKS OUT THE FIRST DAY OF THE YEAR*)
  YRSTARTA:=((YEARREQ - 1) DIV 100);
  YRSTARTB:=YEARREQ - 1 - 100 * YRSTARTA;
  DAYCALC:=799+YRSTARTB+(YRSTARTB DIV 4)+(YRSTARTA DIV 4)-2*YRSTARTA;
  DAYCALC:=(-(DAYCALC - ((DAYCALC DIV 7) * 7)) + 1);
  WRITELN;WRITELN;
```

CHECK ROUTINE

```
(*WORKS OUT WHETHER REQUIRED YEAR IS A LEAP YEAR*)
  IF (YEARREQ=((YEARREQ DIV 4) * 4)) THEN LEAPYEAR:=1;
  IF (YEARREQ=((YEARREQ DIV 100) * 100)) THEN LEAPYEAR:=0;
  IF (YEARREQ=((YEARREQ DIV 400) * 400)) THEN LEAPYEAR:=1;



(*START OF MAIN CONTROL ROUTINE*)
FOR LOOPA:= 1 TO 6 DO BEGIN



  WHICHMONTH (LOOPA);  (*GOTO PROCEDURE TO FIND MONTH DETAILS*)



(*LOADS ARRAY (TABLE) WITH THE DAYS OF THE MONTH*)
  FOR LOOPC:=1 TO 2 DO BEGIN
    FOR LOOPB:=1 TO 42 DO BEGIN
      IF (DAYCALC > DAYSINMONTH[LOOPC]) THEN EOMONTH:=1;
        TABLE [LOOPC,LOOPB]:=DAYCALC;
          IF (EOMONTH = 0) THEN DAYCALC:= DAYCALC + 1;
            IF (EOMONTH = 0) THEN DAYSREM:= DAYSREM + 1;
    END;



(*WORKS OUT THE START OF THE NEXT MONTH*)
    DAYSREM:=DAYSREM MOD 7;
    DAYCALC:=1 - DAYSREM;
    DAYSREM:= 0;
    EOMONTH:= 0;
  END;


(*PRINTS OUT THE DAYS OF THE WEEK*)
  WRITELN(S);
  FOR LOOPC:=1 TO 2 DO BEGIN;
  WRITE(S,'SUN  MON  TUE  WED  THU  FRI  SAT',' ':11);
  END;

WRITELN(S);



(*PRINTS OUT THE DATES OF TWO MONTHS*)
FOR LOOPD:=1 TO 6 DO BEGIN;
  FOR LOOPE:=1 TO 7 DO BEGIN;
    COUNTA:=COUNTA + 1;
    IF (TABLE [1,COUNTA] > 0) AND (TABLE [1,COUNTA] <= DAYSINMONTH[1]) THEN
          WRITE(S,TABLE [1,COUNTA]:2,'   ') ELSE WRITE(S,' ':5);
  END;
  WRITE(S,' ':9);
  FOR LOOPE:=1 TO 7 DO BEGIN;
    COUNTB:=COUNTB + 1;
    IF (TABLE [2,COUNTB] > 0) AND (TABLE [2,COUNTB] <= DAYSINMONTH[2]) THEN
          WRITE(S,TABLE [2,COUNTB]:2,'   ') ELSE WRITE(S,' ':5);
  END;
  WRITELN(S);
END;



COUNTA:=0;
COUNTB:=0;

WRITELN(S);WRITELN(S);WRITELN(S);
END;  (*MAIN CONTROL ROUTINE*)
END;  (*CALENDAR*)
END.  (*PROGRAM*)
```

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REGRESSION

THIS menu-driven program, submitted by Joseph Ferris, calculates and displays the best straight line from a number of points. It runs on a 380Z with Basic 5.0L.

On startup the user is prompted for the number of expected data points. The subroutine at line 106 inputs the desired range of both the X and Y axes, and displays the graph on the screen for the user to plot points. The program calculates the gradient, intercept and scale parameters before drawing the best-fit line on the screen, calculated on the principle of least squares. PC

REGRESSION

```
1 REM BESTFIT
2 CLEAR1000
3 DIM X(20),Y(20)
4 ON BREAK GOTO 174:ON ERROR GOTO 1
5 GOSUB85

6 REM Input data, no validation
7 INPUT"      How many data points (1-20)";N
8 IFN<2ORN>20THENPUT12:?" Try again ...";:GOTO7
9 GOSUB 106
10 IA=1
11 FORI=IATON
12 PUT12:INPUT"Data Point (X,Y)";X(I),Y(I)
13 K=3:GOSUB165
14 NEXT

15 REM Sort list of data points
16 FORI=1TON-1
17 FORJ=I+1TON
18 IFX(I)<X(J)THEN21
19 T=X(I):X(I)=X(J):X(J)=T
20 T=Y(I):Y(I)=Y(J):Y(J)=T
21 NEXT:NEXT
22 K=3:GOSUB147

23 REM Validate response to menu
24 PUT12:?"Which command (A,D,G,M,I,P,R or X)?": '
25 A$=GET$()
26 IFA$="A" OR A$="a"THEN 69
27 IFA$="D" OR A$="d"THEN 73
28 IFA$="G" OR A$="g"THEN 64
29 IFA$="I" OR A$="i"THEN 67
30 IFA$="M" OR A$="m"THEN82
31 IFA$="P" OR A$="p"THEN 43
32 IFA$="R" OR A$="r"THEN 36
33 IFA$="X" OR A$="x"THEN 174
34 GOTO 25

35 REM Rescale the complete graph on screen
36 K=3:GOSUB106
37 FOR I=1TON
38 GOSUB165
39 NEXT
40 GOSUB147
41 GOTO24
42 REM Output to an Epson FX-80 printer type 4.3
43 PUT12:INPUT"Title":T$
44 PUT12:INPUT"Today's Date":D$
45 PUT12:?"Attend to printer,then wait one moment"
46 LPRINTD$;TAB(12);"BEST FITTING STRAIGHT LINE PROGRAM"
47 A$="1"
48 CALL"PRINTER",1.0:CALL"PATSIZE",1.1
49 CALL"SHADING",3,VARADR(A$):CALL"SHADING",2,VARADR(A$)
50 CALL"DUMP",0,0,320,192,1
51 LPRINT:LPRINTTAB((32-LEN(T$))/2);T$
52 LPRINT:LPRINT
53 LPRINT "X(Observed)";TAB(15);"Y(Observed)";TAB(30);"Y(Calculated)"
54 LPRINT"-----------";TAB(15);"-----------";TAB(30);"--------------"
55 LPRINT:LPRINT
56 FOR I=1TON
57 LPRINT TAB(5-LEN(STR$(INT(X(I))))):X(I);
58 LPRINT TAB(20-LEN(STR$(INT(Y(I))))):Y(I);
59 LPRINT TAB(35-LEN(STR$(INT(AP*X(I)+BP)))):AP*X(I)+BP
60 NEXT
61 LPRINT:LPRINT"Gradient =";AP;"      Intercept =";BP
62 GOTO 24

63 REM Display Gradient of line
64 PUT12:?"Gradient of Line is";AP
65 ?:?" Press any key to continue.";:A$=GET$():GOTO 24

66 REM Display intercept on Y-axis
67 PUT12:?"Intercept on Y-AXIS is ";BP:GOTO 65

68 REM Add other data points
69 PUT12:INPUT " Add how many points";NA
70 K=-3:GOSUB 161
71 IA=N+1:N=N+NA:GOTO 11

72 REM Delete appropriate data point
73 PUT12:?" Delete which point (1-";N;")";
74 INPUT W
75 IF W<1 OR W>N-THEN 73
76 IFN=2THEN24
77 I=W:K=-3:GOSUB 165
78 GOSUB 161
79 FOR I=W TO N-1:X(I)=X(I+1):Y(I)=Y(I+1):NEXT
80 N=N-1:K=3:GOSUB 147:GOTO 24

81 REM Master menu
82 PUT12:GOSUB85:?"   Press any key to continue?";
83 A$=GET$():GOSUB117:GOTO37
84 REM Display commands
85 GOSUB171
86 Y=160:CALL"FILL",45,150,275,180,1
87 CALL"PLOT",45,150,2:CALL"LINE",45,180:CALL"LINE",275,180
88 CALL"LINE",275,150:CALL"LINE",45,150
89 CALL"PLOT",0,0:CALL"LINE",0,191:CALL"LINE",318,191
90 CALL"LINE",318,0:CALL"LINE",0,0
91 A$="BEST FITTING STRAIGHT LINE":GOSUB103
92 A$="":GOSUB103
93 A$="A .... Add data points":GOSUB103
94 A$="D .... Delete data point":GOSUB103
95 A$="G .... Gradient displayed":GOSUB103
96 A$="I .... Intercept displayed":GOSUB103
97 A$="M .... Menu of commands":GOSUB103
98 A$="P .... Print graph and data":GOSUB103
99 A$="R .... Re-scale graph":GOSUB103
100 A$="X .... eXit program":GOSUB103
101 RETURN

102 REM Display the list of commands available
103 CALL"STPLOT",55,Y,VARADR(A$),3:Y=Y-15
104 RETURN

105 REM Scale the X-axis
106 PUT12
107 INPUT"X-axis range (X-min, X-max)";XN,XM
108 D=(XM-XN)/5:GOSUB136
109 IF FL=1THEN PUT12:?"Range not suitable":GOTO 107

110 REM SX and SY are step intervals
111 SX=S
112 PUT12
113 INPUT"Y-axis range (Y-min, Y-max)";YN,YM
114 D=(YM-YN)/6:GOSUB136
115 IF FL=1THEN PUT12:?"Range not suitable":GOTO 113
116 SY=S

117 REM Draw the X-Grid
118 GOSUB171
119 XB=SX*INT(XN/SX+0.5*SGN(XN))
120 XT=XB+5*SX
121 FORI=0TO5
122 CALL"PLOT",64*I,0,2:CALL"LINE",64*I,192,2
123 IFXB+I*SX=0THENCALL"LINE",64*I,0,3:
    A$="Y":CALL"STPLOT",64*I+4,180,VARADR(A$),3
124 A$=STR$(XB+I*SX):CALL"STPLOT",64*I,10,VARADR(A$),2:NEXT
125 REM Draw the Y-Grid
126 YB=SY*INT(YN/SY+0.5*SGN(YN))
127 YT=YB+6*SY
128 FORI=0TO6
129 CALL"PLOT",1,32*I,2:CALL"LINE",320,32*I
130 IF YB+I*SY=0 THEN CALL"LINE",0,32*I,3:
    A$="X":CALL"STPLOT",300,32*I+3,VARADR(A$),3
131 A$=STR$(YB+I*SY):CALL"STPLOT",16,32*I+3,VARADR(A$),2:NEXT
132 CALL"PLOT",0,191:CALL"LINE",318,191:CALL"LINE",318,0
133 XN=XB:XM=XT:YN=YB:YM=YT
134 RETURN

135 REM Determine suitable interval for axes
136 FL=0:IF D<1*10^-3 THEN 144
137 FOR I = -3 TO 3
138 IF D<=1*10^I THEN S=1*10^I:RETURN
139 IF D<=1.5*10^ITHENS=1.5*10^I:RETURN
140 IF D<=2*10^I THEN S=2*10^I:RETURN
141 IF D<=2.5*10^I THEN S=2.5*10^I:RETURN
142 IF D<=5*10^I THEN S=5*10^I:RETURN
143 NEXT
144 FL=1:REM Only SET when D out of range
145 RETURN

146 REM Redraw the best fitting line
147 GOSUB 152
148 GOSUB 158
149 GOSUB 161
150 RETURN

151 REM Evaluate the parameters Q1-Q4
152 Q1=0:Q2=0:Q3=0:Q4=0
153 FOR I=1 TO N
154 Q1=Q1+X(I)*Y(I):Q2=Q2+X(I):Q3=Q3+Y(I):Q4=Q4+X(I)*X(I)
155 NEXT
156 RETURN

157 REM Calculate value of Gradient (AP) and Intercept (BP) of line
158 AP=(N*Q1-Q2*Q3)/(N*Q4-Q2*Q2):BP=(Q3-AP*Q2)/N
159 RETURN

160 REM Draw the best fit line here
161 CALL"PLOT",0,192*(AP*XB+BP-YB)/(YT-YB),K
162 CALL"LINE",320,192*(AP*XT+BP-YB)/(YT-YB)
163 RETURN

164 REM Plot the next point
165 XS=320*(X(I)-XN)/(XM-XN)+1:YS=192*(Y(I)-YN)/(YM-YN)+1
166 CALL"PLOT",XS,YS,K:CALL"PLOT",XS-2,YS-2
167 CALL"LINE",XS-2,YS+2:CALL"LINE",XS+2,YS+2
168 CALL"LINE",XS+2,YS-2:CALL"LINE",XS-1,YS-2
169 RETURN
170 REM Initialise the screen display
171 PUT27."=0J":PUT12:CALL"RESOLUTION",0,2
172 CALL"COLOUR",0,6:CALL"COLOUR",2,100:
    CALL"COLOUR",3,255:CALL"COLOUR",1,0
173 RETURN

174 REM Exit program, leave screen tidy
175 CALL"RESOLUTION",0,0:PUT27,"=1J":PUT31
176 END
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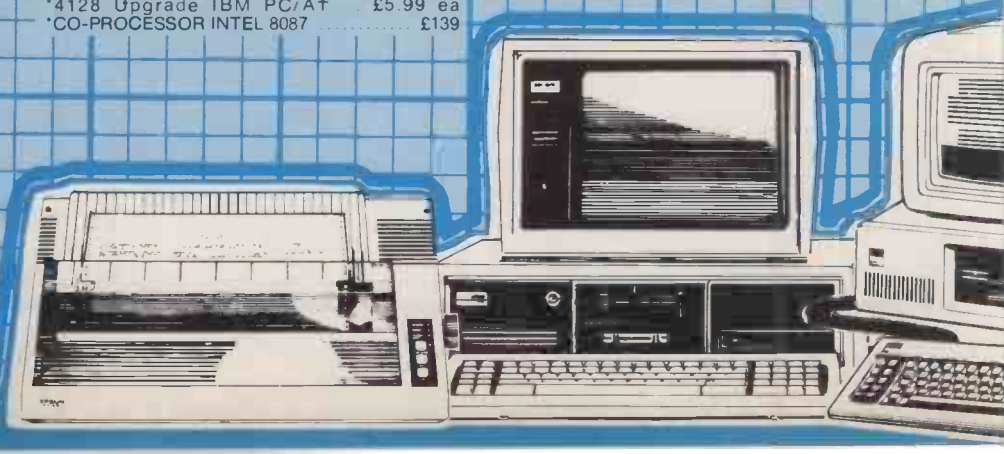

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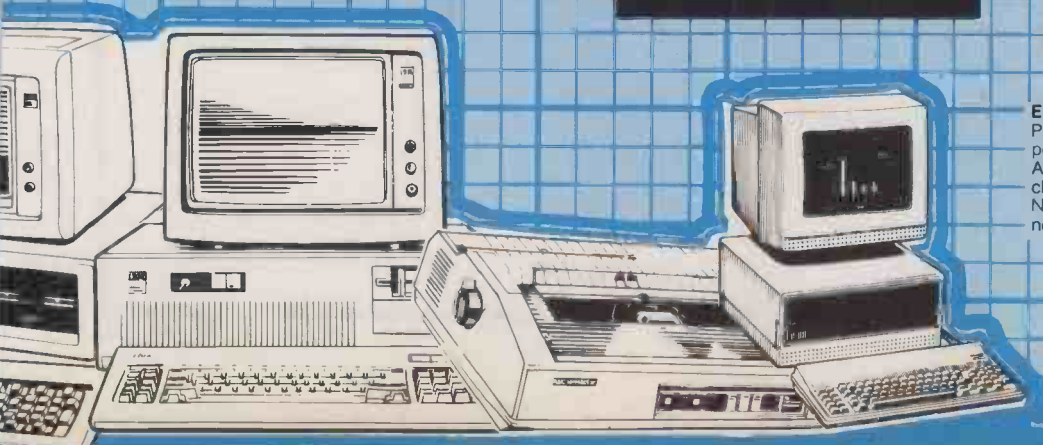

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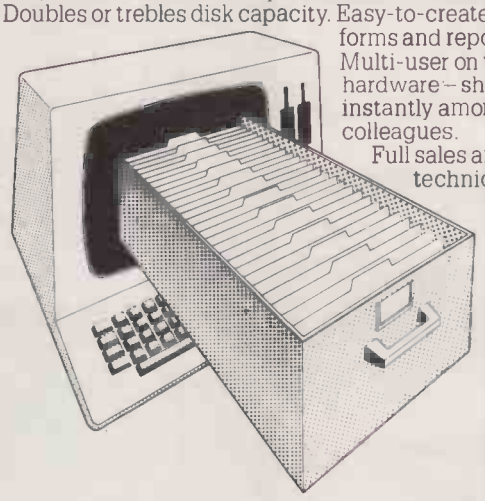

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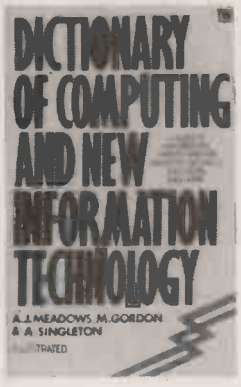
TOMES OF REFERENCE

Carol Hammond dips into a selection of microcomputing dictionaries and encyclopaedias.

THE PROBLEM for any sort of publication that claims to be a dictionary, glossary or encyclopaedia of computing terminology is that it cannot be all things to all its readers. At some time or other, everybody needs to refer to such guides. Whether they will find the information they are looking for depends on how much they know, who the guide is aimed at and how well it manages to explain a term in a limited space.

Among the guides reviewed here, the *Dictionary of Computing and New Information Technology* emerges as the most likely to succeed as a handy reference guide at a reasonable price. The authors claim that the dictionary is aimed at a non-specialist audience, but it is not in any way condescending.

The book is clearly laid out, with two columns of text per page. Where it would be useful to refer to other entries, this is indicated by picking out words in italics. This simple and uncluttered method of cross-referencing saves a lot of time and confusion. In many of the other guides you could spend as much time understanding when and why words are in bold, small capitals, square brackets, etc., as in taking in the explanation. The authors are not afraid to take a page to explain a particularly complicated term where they feel it to be appropriate. There are also diagrams, drawings and maps to explain everything from what various keyboard layouts look like, to the principles of holography and the entry points for Euronet.



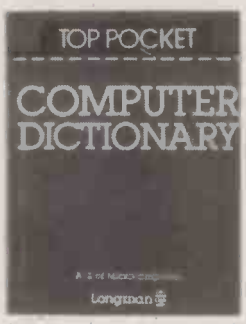
Adrian Stokes' *Concise Encyclopaedia of Information Technology* also does well, with clear and concise explanations and a useful table of the most commonly used acronyms and their meanings. Where it falls down is in its cost. It comes hardbound, but at £18.50 it is grossly overpriced.

Both *The Encyclopaedia of Microcomputer Terminology* and *A Dictionary of Computer Terms* win out in the various appendices they provide. The latter offers conversion tables from decimal to binary, hexadecimal and octal, plus tables of the EBCDIC and ASCII character sets.

The *Encyclopaedia of Microcomputer Terminology* caps this with its 53 pages of appendices. These include a Basic keyword glossary, and useful cribs in the form of mathematical formulae for electronics, flowchart symbols, colour codes for electronic components, logic functions and symbols, logic gates plus number systems and schematic systems for use in circuit diagrams. Of particular note are the glossaries on word processing, music synthesis, video discs and bar coding, so that you can have a brief resumé of the terms used in a certain area of technology.

McGraw-Hill's *Dictionary of Computers* is certainly of equal merit to the last two publications, but it is aimed at the readers with more technical knowledge and needs. Unlike most of the other books reviewed here it has no eulogising introduction in the style of "computers are the final frontier and we must get familiar with the jargon so we can swap buzzwords with the kids over breakfast". This is a bumper-size book of facts which delves deep into parts of the subject the others cannot reach. It is not for someone who wants to know what Ada or CP/M are — more for those who are involved with the nuts, bolts and chips of computers.

The Prentice-Hall *Standard Glossary of Computer Terminology* is one of the guides that, unfortunately, does contain a gushing introduction. In it, the author quotes from Shakespeare and Rudyard Kipling in his reveries about the wondrous new technology, which he describes as embracing "solid, old-fashioned, all-American words like 'program' and 'friendly', and even the word, 'word' itself". If you have any energy left after wading through nine pages in this vein, you may be disappointed. Though this book is in a larger format than any of the others, measuring 11in. by 8.5in., whole pages are given over to entries which do no more than make cross-references to entries elsewhere. Further space is wasted on dull black-and-white photographs of machines, with uninspired captions such as "Microcomputer" and "Plasma display". Even worse, the quality of reproduction of the latter is so



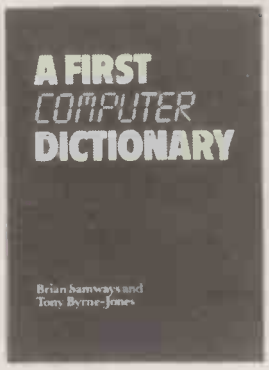
bad that no image is apparent on the screen.

The *Top Pocket Computer Dictionary*, from the Longman stable, is the smallest book among the batch, as befits its title. It is in the same genre as many pocket-size foreign-language dictionaries: they will help you to ask your way to the Post Office, but will not teach you how to construct a sentence. So the size of the book is both a blessing and a limitation — it is probably best for schoolchildren.

I D Poole's *Computer Terminology Explained* tries to be a compact basic guide for the home-computer enthusiast. Perhaps a few years ago, when such enthusiasts wore tweeds and were exiled to the garden shed, it might have been sufficient. But as computing has become more sophisticated so have the accompanying reference books. This one, with its tacky appearance and scant amount of information over 82 pages, does not compare with the competition, even at a price of £1.95.

A sign of the sophistication of the reference guide market is Jon Wedge's spoof, *The Computer Dictionary*. The author claims to be "a computer person" who wants to explain the words he uses all day in a way "a reasonable person" can understand. The result is a book that sometimes manages to be funny and to explain computer jargon at the same time. His advice on the pronunciation of ASCII as "Askey in tribute to that great English comedian, Arthur" would certainly have been useful to me the first time I came across the acronym.

However, like all such "Sloane Rangers' Eating Habits" type books that arrive in your Christmas stocking, the guffaws are over by Christmas dinner and the book soon becomes exiled to a dusty bookshelf or set aside for the next jumble sale. But if you think you know someone who may enjoy in-jokes about programmers and the odd sexist cartoon, this will no doubt keep them more than happy.



The authors of *A First Computer Dictionary* claim that it is aimed at beginners of all ages. However, judging by the size of the type and illustrations, and the book's general style, it appears most suitable for children. For example, the letters used to indicate the beginning of each section take up about a quarter of a page. While these look very jolly, since they are designed to look like graphics characters, they would be somewhat out of place on an executive desk.

The book also seems to be dan-

(continued on next page)

BOOK REVIEWS

TOMES OF REFERENCE

Dictionary of Computing and New Information Technology by A J Meadows, M Gordon and A Singleton. Published by Century, £2.95. ISBN 0 7126 0399 9

Concise Encyclopaedia of Information Technology by Adrian V Stokes. Published by Gower, £18.50. ISBN 0 566 02531 0

The Encyclopaedia of Microcomputer Terminology by Linda Gail Christie and John Christie. Published by Unwin, £4.95. ISBN 0 04 032001 4

A Dictionary of Computer Terms by Laura Darcy and Louise Boston. Published by Fontana, £2.95. ISBN 0 00 636801 8

Dictionary of Computers by Sybil P Parker. Published by McGraw-Hill, £15.95. ISBN 0 07 045415 9

Standard Glossary of Computer Terminology by Robert A Edmunds. Published by Prentice-Hall, £18.15. ISBN 0 13 698234 4

Top Pocket Computer Dictionary by Charles J Sippl. Published by Longman, £1.25. ISBN 0 582 55568

Computer Terminology Explained by I D Poole. Published by Bernard Babani, £1.95. ISBN 0 85934 123 2

The Computer Dictionary by Jon Wedge. Published by Adam and Charles Black, £3.95: ISBN 0 7136 2681 X

A First Computer Dictionary by Brian Samways and Tony Byrne-Jones. Published by Macmillan, £3.50. ISBN 0 333 38379 6

A Glossary of Computing Terms by the BCS Schools Committee Working Party. Published by Cambridge University Press, £1.75. ISBN 0 521 31777 0

Microelectronics A to Z by Malcolm Plant. Published by Longman, £3.95. ISBN 0 582 89285 6

Dictionary of Computer Graphics by John Vince. Published by Francis Pinter, £15. ISBN 0 86187 473 0

(continued from previous page)

gerously basic, reducing some explanations to such simple terms that the result is incomprehensible. For instance, in a book where the authors feel it necessary to provide a large drawing of a DIN plug and its socket, the explanation of AI as " 'Learning' from what happened last time; a machine that uses a program that improves itself each time it is run" seems inadequate.

The British Comptuer Society's *Glossary Of Computing Terms* covers 750 terms currently in use, divided into 15 sections. It is most useful as a guide to what terms to use in particular areas. In the Computer Personnel section it even goes so far as to mention the use of "liveware", with the warning "not to be recommended". A useful addition to a reference library, if not your bookshelves.

Finally, two publications aimed at more specialist areas: Malcolm Plant's *Microelectronics A to Z* and John Vince's *Dictionary of Computer Graphics*. The former is a little gem: the author explains what various terms mean in such a clear and simple manner that even people with little or no knowledge of the subjects can understand. This guide differs from the rest in its emphasis on the chip and its applications rather than on computers alone. In it you can look up subjects varying from Prestel and viewdata, to air-traffic control and television.

The *Dictionary of Computer Graphics* is even more specialised. In it the author tries to explain in lay terms computer-graphics jargon used in technical literature. I found the explanations quite complex, but anyone with the enthusiasm to buy the book would probably already be more familiar with the subject matter. However, the guide is also let down by the personal tone taken by the author, who enthuses over various machines and techniques in a way you do not expect in a dictionary. It seems to be more an encouragement to get those half-interested in computer graphics more interested, with references to various journals and papers for further information. Despite the high price tag of £15 there is very little colour — which is a shame in a book devoted to graphics. PC

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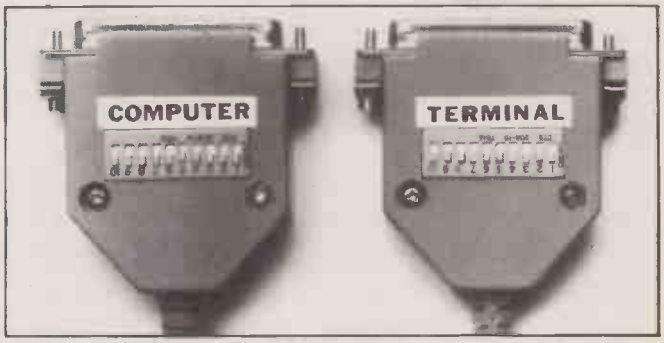

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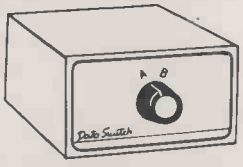

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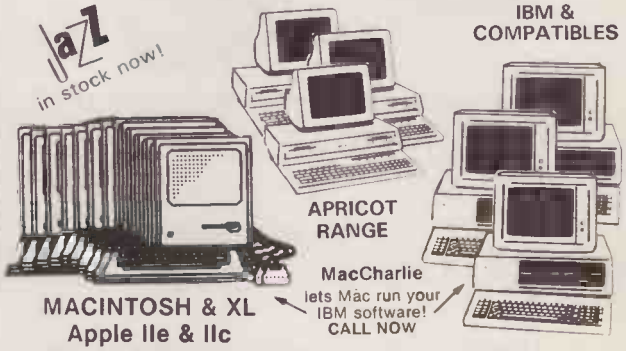

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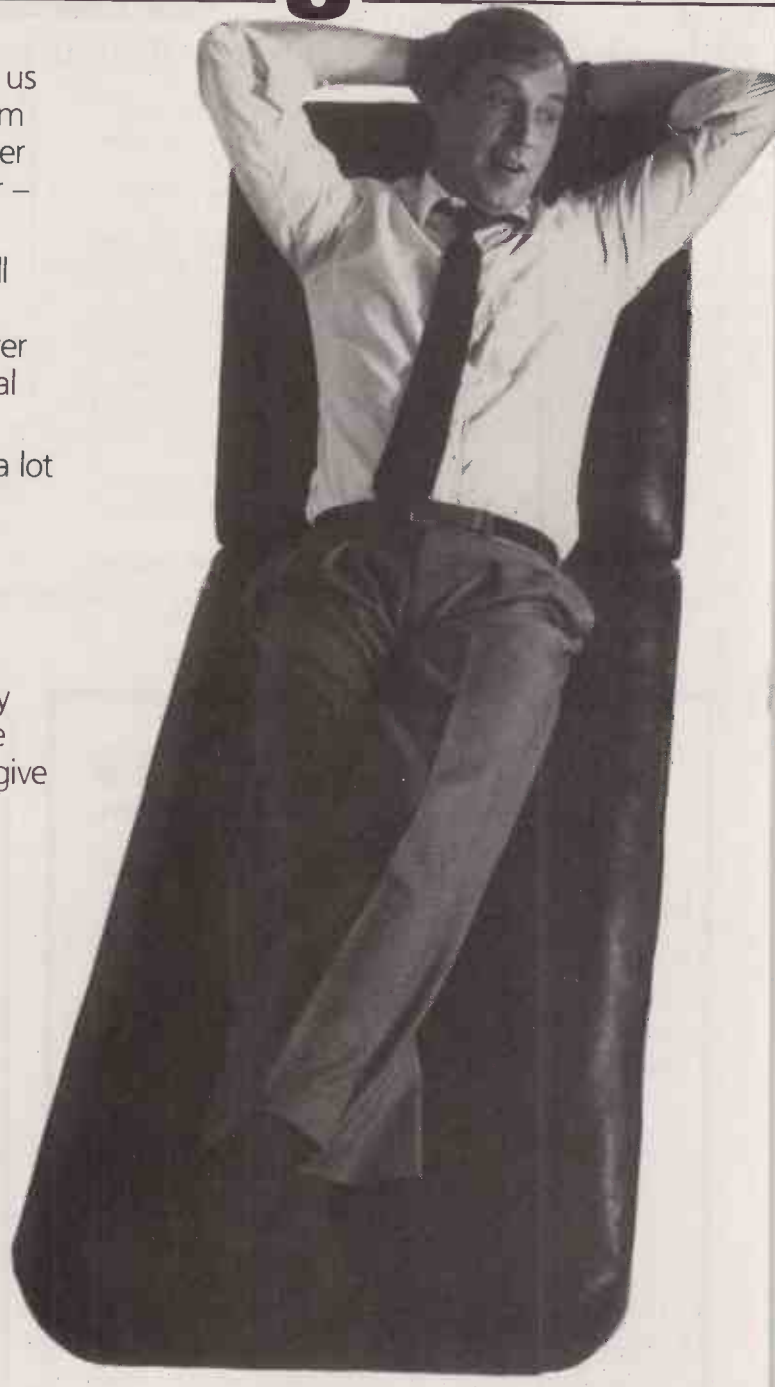

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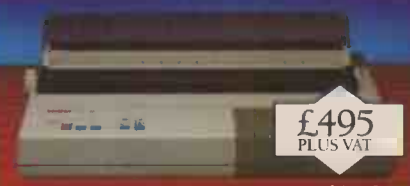

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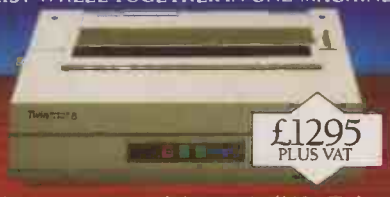

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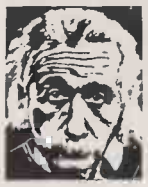

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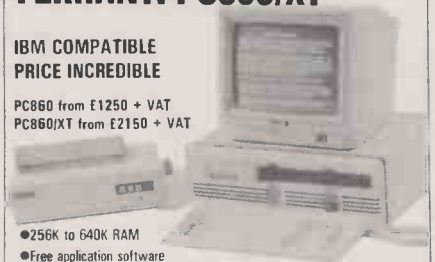

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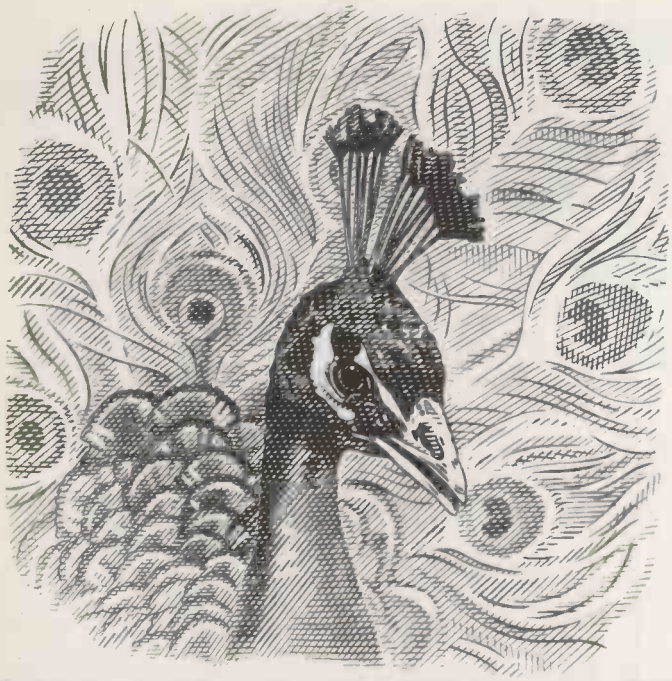

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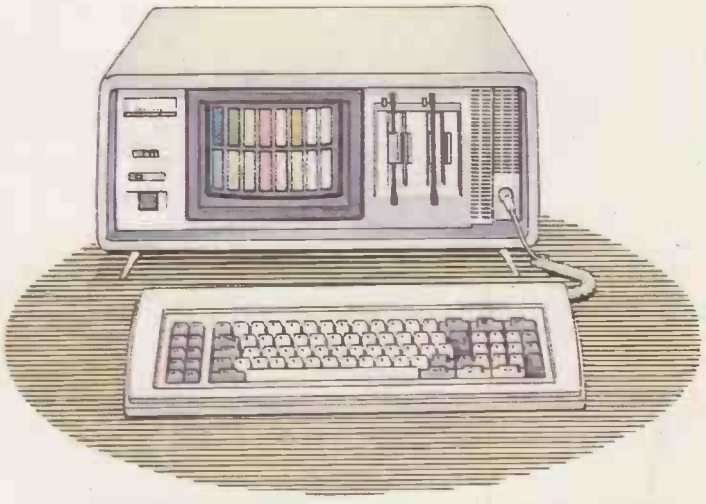

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